

IMPERIAL COUNTY AIR POLLUTION CONTROL DISTRICT



**April 14, 2016
Exceptional Event Documentation
For the Imperial County PM₁₀ Nonattainment Area**

FINAL REPORT
December 10, 2018

TABLE OF CONTENTS

SECTION	PAGE
I	Introduction1
I.1	Demonstration Contents2
I.2	Requirements of the Exceptional Event Rule2
I.2.a	Public Notification that a potential event was occurring (40 CFR §50.14(c)(1)).....3
I.2.b	Initial Notification of Potential Exceptional Event (INPEE) (40 CFR §50.14(c)(2))3
I.2.c	Documentation that the public comment process was followed for the event demonstration that was flagged for exclusion (40 CFR §50.14(c)(3)(v)).....4
I.2.d	Documentation submittal supporting an Exceptional Event Flag (40 CFR §50.14(c)(3)(i)).....4
I.2.e	Necessary demonstration to justify an exclusion of data under (40 CFR §50.14(c)(3)(iv)).....4
II	April 14, 2016 Conceptual Model6
II.1	Geographic Setting and Monitor Locations6
II.2	Climate18
II.3	Event Day Summary21
III	Historical Concentrations.....30
III.1	Analysis30
III.2	Summary36
IV	Not Reasonably Controllable or Preventable37
IV.1	Background37
IV.1.a	Control Measures.....38
IV.1.b	Additional Measures39
IV.1.c	Review of Source Permitted Inspections and Public Complaints40
IV.2	Forecasts and Warnings.....42
IV.3	Wind Observations43
IV.4	Summary43
V	Clear Causal Relationship.....44
V.1	Discussion.....44
V.2	Summary55
VI	Conclusions57
VI.1	Affects Air Quality57

VI.2	Not Reasonably Controllable or Preventable	57
VI.3	Natural Event	58
VI.4	Clear Causal Relationship.....	58
VI.5	Historical Concentrations.....	58
Appendix A:	Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))	60
Appendix B:	Meteorological Data	76
Appendix C:	Correlated PM ₁₀ Concentrations and Winds	90
Appendix D:	Regulation VIII – Fugitive Dust Rules	95

LIST OF FIGURES

FIGURE	PAGE
Figure 2-1	Colorado Desert Area Imperial County.....6
Figure 2-2	Surrounding Areas of the Salton Sea7
Figure 2-3	Jacumba Peak.....8
Figure 2-4	Anza-Borrego Desert State Park Carrizo Badlands9
Figure 2-5	Anza-Borrego Desert State Park Desert View from Font’s Point.....10
Figure 2-6	Location and Topography of Imperial County11
Figure 2-7	Deserts in California, Yuma and Mexico12
Figure 2-8	Monitoring Sites in and around Imperial County13
Figure 2-9	Salton City Air Monitoring Station14
Figure 2-10	Salton City Air Monitoring Station West.....15
Figure 2-11	Naval Test Base Air Monitoring Station15
Figure 2-12	Naval Test Base Air Monitoring Station West.....16
Figure 2-13	Sonny Bono Air Monitoring Station16
Figure 2-14	Sonny Bono Salton Sea National Wildlife Refuge17
Figure 2-15	Sonoran Desert Region19
Figure 2-16	Imperial County Historical Weather20
Figure 2-17	Upper Level Trough Approaches Region22
Figure 2-18	Surface Gradient Tightens23
Figure 2-19	Surface Gradient Remains Packed24
Figure 2-20	Ramp Up Analysis April 14, 201625

Figure 2-21	NOAA HYSPLIT Model April 14, 2016.....	27
Figure 2-22	72 Hour Wind Speeds Regional Sites.....	28
Figure 2-23	72 Hour PM ₁₀ Concentrations at Various Sites	29
Figure 3-1	Brawley Historical Comparison FRM and FEM PM ₁₀ 24 Hr Avg Concentrations January 1, 2010 to April 14, 2016	31
Figure 3-2	Westmorland Historical Comparison FRM and FEM PM ₁₀ 24 Hr Avg Concentrations January 1, 2010 to April 14, 2016	32
Figure 3-3	Brawley Seasonal Comparison FRM and FEM PM ₁₀ 24 Hr Avg Concentrations April 1, 2010 to June 30, 2016	33
Figure 3-4	Westmorland Seasonal Comparison FRM and FEM PM ₁₀ 24 Hr Avg Concentrations April 1, 2010 to June 30, 2016	34
Figure 3-5	Brawley Historical FRM and FEM PM ₁₀ 24 Hr Avg Concentrations January 1, 2010 to April 14, 2016	35
Figure 3-6	Westmorland Historical FRM and FEM PM ₁₀ 24 Hr Avg Concentrations January 1, 2010 to April 14, 2016	35
Figure 4-1	Regulation VIII Graphic Timeline Development.....	38
Figure 4-2	Permitted Sources.....	41
Figure 4-3	Non-Permitted Sources.....	42
Figure 5-1	Surface Pressure Gradient Tightens	44
Figure 5-2	High Across Southeastern California Raise Dust/Sand	45
Figure 5-3	Aerosol Optical Depth Terra Satellite	46
Figure 5-4	Aerosol Optical Depth Aqua Satellite	47
Figure 5-5	Wind Advisory Map and Wind Speeds April 14, 2016.....	48
Figure 5-6	Exceedance Timeline	51
Figure 5-7	Brawley PM ₁₀ Concentrations and Wind Speed Correlation.....	52

Figure 5-8	Westmorland PM ₁₀ Concentrations and Wind Speed Correlation	53
Figure 5-9	Westmorland and Brawley PM ₁₀ Concentrations and Upstream Wind Speeds	54
Figure 5-10	Air Quality Index for Westmorland April 14, 2016	55
Figure 5-11	April 14, 2016 Wind Event Take Away Points.....	56

LIST OF TABLES

TABLE	PAGE
Table 1-1	Concentrations of PM ₁₀ on April 14, 20161
Table 2-1	Monitoring Sites in Imperial County, Riverside County and Arizona April 14, 2016.....18
Table 2-2	Wind Speeds on April 14, 2016.....26
Figure 5-1	Wind Speeds and PM ₁₀ Concentrations for Brawley April 14, 201649
Figure 5-2	Wind Speeds and PM ₁₀ Concentrations for Westmorland April 14, 2016.....50
Table 6-1	Technical Element Checklist Exceptional Event Demonstration for High Wind Dust Event (PM ₁₀)57

ACRONYM DESCRIPTIONS

AOD	Aerosol Optical Depth
AQI	Air Quality Index
AQS	Air Quality System
BACM	Best Available Control Measures
BAM 1020	Beta Attenuation Monitor Model 1020
BLM	United States Bureau of Land Management
BP	United States Border Patrol
CAA	Clean Air Act
CARB	California Air Resources Board
CMP	Conservation Management Practice
DCP	Dust Control Plan
DPR	California Department of Parks and Recreation
EER	Exceptional Events Rule
EPA	Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GOES-W/E	Geostationary Operational Environmental Satellite (West/East)
HC	Historical Concentrations
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
ICAPCD	Imperial County Air Pollution Control District
INPEE	Initial Notification of a Potential Exceptional Event
ITCZ	Inter Tropical Convergence Zone
KBLH	Blythe Airport
KCZZ	Campo Airport
KIPL	Imperial County Airport
KNJK	El Centro Naval Air Station
KNYL/MCAS	Yuma Marine Corps Air Station
KPSP	Palm Springs International Airport
KTRM	Jacqueline Cochran Regional Airport (aka Desert Resorts Rgnl Airport)
PST	Local Standard Time
MMML/MXL	Mexicali, Mexico Airport
MODIS	Moderate Resolution Imaging Spectroradiometer
MPH	Miles Per Hour
MST	Mountain Standard Time
NAAQS	National Ambient Air Quality Standard
NCAR	National Center for Atmospheric Research
NCEI	National Centers for Environmental Information
NEAP	Natural Events Action Plan
NEXRAD	Next-Generation Radar
NOAA	National Oceanic and Atmospheric Administration
nRCP	Not Reasonably Controllable or Preventable
NWS	National Weather Service

PDT	Pacific Daylight Time
PM ₁₀	Particulate Matter less than 10 microns
PM _{2.5}	Particulate Matter less than 2.5 microns
PST	Pacific Standard Time
QA/QC	Quality Assured and Quality Controlled
QCLCD	Quality Controlled Local Climatology Data
RACM	Reasonable Available Control Measure
RAWS	Remote Automated Weather Station
SIP	State Implementation Plan
SLAMS	State Local Ambient Air Monitoring Station
SMP	Smoke Management Plan
SSI	Size-Selective Inlet
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTC	Coordinated Universal Time
WRCC	Western Regional Climate Center

I Introduction

On April 14, 2016, State and Local Ambient Air Monitoring Stations (SLAMS), located in Brawley (AQS Site Code 060250007) and Westmorland (AQS Site Code 060254003), California measured exceedances of the National Ambient Air Quality Standard (NAAQS). The Federal Equivalent Method (FEM), Beta Attenuation Monitor Model 1020 (BAM 1020) measured (midnight to midnight) 24-hr average Particulate Matter less than 10 microns (PM₁₀) concentrations of 228 µg/m³ and 163 µg/m³ (**Table 1-1**). PM₁₀ 24-hr measurements above 150 µg/m³ are exceedances of the NAAQS. The SLAMS in Brawley and Westmorland were the only stations in Imperial County to measure exceedances of the PM₁₀ NAAQS on April 14, 2016.

TABLE 1-1
CONCENTRATIONS OF PM₁₀ ON APRIL 14, 2016

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION µg/m ³	PM ₁₀ NAAQS µg/m ³
4/14/2016	Westmorland	06-025-4003	3	23	163	150
4/14/2016	Brawley	06-025-0007	3	23	228	150
4/14/2016	Calexico	06-025-0005	3	23	62	150
4/14/2016	El Centro	06-025-1003	4	23	48	150
4/14/2016	Niland	06-025-4004	3	24	118	150

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted¹

The Imperial County Air Pollution Control District (ICAPCD) has been submitting PM₁₀ data from Federal Reference Method (FRM) Size-Selective Inlet (SSI) instruments since 1986 into the United States Environmental Protection Agency's (USEPA) Air Quality System (AQS). Prior to 2013 all continuous measured PM₁₀ data was non-regulatory, thus measured in local conditions. However, by 2013 ICAPCD began formally submitting continuous FEM PM₁₀ data from BAM 1020's into the USEPA managed AQS. Because regulatory consideration of reported data must be in standard conditions, as required by USEPA, all continuous PM₁₀ data since 2013 is regulatory. On April 14, 2016, elevated particulate matter affected the Brawley and Westmorland monitors when entrained fugitive windblown dust from high winds associated with a large and deep upper level trough with an accompanying strengthening of surface gradients moved over the region and into Imperial County.

This report demonstrates that a naturally occurring event caused an exceedance observed on April 14, 2016, which elevated particulate matter and affected air quality. The report provides concentration to concentration monitoring site analyses supporting a clear causal relationship between the event and the monitored exceedances and provides an analysis supporting the not

¹ According to the National Institute of Standards and Technology (NIST) Time and Frequency Division the designation of the time of day for specific time zones are qualified by using the term "standard time" or "daylight time". For year-round use the designation can be left off inferring "local time" daylight or standard whichever is present. For 2016, Pacific Daylight Time (PDT) is March 13 through November 6. <https://www.nist.gov/pml/time-and-frequency-division/local-time-faq#intl>

reasonably controllable or preventable (nRCP) criteria. Furthermore, the report provides information that the exceedances would not have occurred without the entrainment of fugitive windblown dust from outlying deserts and mountains within the Sonoran Desert. The report further substantiates the request by the ICAPCD to exclude PM₁₀ 24-hour NAAQS exceedances of 228 µg/m³ and 163 µg/m³ (**Table 1-1**) as an exceptional event. This demonstration substantiates that this event meets the definition of the USEPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER)².

I.1 Demonstration Contents

Section II - Describes the April 14, 2016 event as it occurred in California and into Imperial County, providing background information of the exceptional event and explaining how the wind driven emissions from the event led to the exceedance at the Brawley and Westmorland monitors.

Section III – Using time-series graphs, summaries and historical concentration comparisons of the Brawley and Westmorland stations this section discusses and establishes how the April 14, 2016 event affected air quality such that there is a demonstration of the clear causal relationship between the event and the monitored exceedance. It is perhaps of some value to mention that the time-series graphs include PM₁₀ data measured in both local conditions and standard conditions. Measured PM₁₀ continuous data prior to 2013 is in local conditions, all other data is in standard conditions. The concentration difference between local and standard conditions has an insignificant impact on any data analysis. Overall, this section provides the evidence that human activity played little or no direct causal role in the April 14, 2016 event and its resulting emissions defining the event as a “natural event”.³

Section IV - Provides evidence that the event of April 14, 2016 was not reasonably controllable or preventable despite the full enforcement and implementation of Best Available Control Measures (BACM).

Section V - Brings together the evidence presented within this report to show that the exceptional event affected air quality; that the event was not reasonably controllable or preventable; that there was a clear causal relationship between the event and the exceedance, and that the event was a natural event.

I.2 Requirements of the Exceptional Event Rule

The above sections combined comprise the technical requirements described under the Exceptional Events Rule (EER) under 40 CFR §50.14(c)(3)(iv). However, in order for the USEPA to concur with flagged air quality monitoring data, there are additional non-technical requirements.

² "Treatment of Data Influenced by Exceptional Events; Final Guidance", 81 FR 68216, October 2, 2016

³ Title 40 Code of Federal Regulations part 50: §50.1(k) Natural event means an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions.

I.2.a Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

The ICAPCD published the National Weather Service (NWS) forecast for April 14, 2016. The published notification, via the ICAPCD's webpage, described a vigorous upper level low-pressure system moving southeastward from the Pacific Northwest reaching Arizona by Friday, April 15, 2016. The ICAPCD notification included forecast summaries from the San Diego and Phoenix NWS weather stories and summaries describing a 3-day event with strong gusty westerly winds, primarily in the mountains and deserts. Expected, were increased winds through the day as the upper low over the Pacific Northwest moved southeast toward the Great Basin. The strong gusty westerly winds prompted both the San Diego and Phoenix NWS offices to warn of the potential of a significant hazard to motorist because of reduced visibility resulting from blowing dust and sand. Because of the potential for suspended particles and poor air quality, the ICAPCD issued a "No Burn" day for Imperial County on April 14, 2016. **Appendix A** contains copies of notices pertinent to the April 14, 2016 event.

I.2.b Initial Notification of Potential Exceptional Event (INPEE) (40 CFR §50.14(c)(2))

States are required under federal regulation to submit measured ambient air quality data into the AQS. AQS is the federal repository of Quality Assured and Quality Controlled (QA/QC) ambient air data used for regulatory purposes. When States intend to request the exclusion of one or more exceedances of a NAAQS as an exceptional event a notification to the Administrator is required. Notification occurs when an agency submits a request, which includes an initial event description, for flagging data in AQS.

On October 3, 2016, the US EPA promulgated revisions to the Exceptional Events rule, which included the requirement of an "Initial Notification of Potential Exceptional Event" (INPEE) process. This revised INPEE process requires communication between the US EPA regional office and the State, prior to the development of a demonstration. The intent of the INPEE process is twofold: to determine whether identified data may affect a regulatory decision and whether a State should develop/submit an EE Demonstration.

The ICAPCD made a formal written request to the California Air Resources Board (CARB) to place preliminary flags on SLAMS measured PM₁₀ concentrations from the Brawley and Westmorland monitors on April 17, 2017. The INPEE, for the April 14, 2016 event, was formally submitted by the CARB to USEPA Region 9 on April 24, 2017. Subsequently there after a second revised request was sent to CARB requesting preliminary flags on additional days for 2016. **Table 1-1** above provides the PM₁₀ measured concentrations for all monitors in Imperial County on April 14, 2016. The submitted request included a brief description of the meteorological conditions for April 14, 2016 indicating that a potential natural event occurred.

I.2.c Documentation that the public comment process was followed for the event demonstration that was flagged for exclusion (40 CFR §50.14(c)(3)(v))

The ICAPCD posted, for a 30-day public review, a draft version of this demonstration on the ICAPCD webpage and published a notice of availability in the Imperial Valley Press on January 10, 2018. The published notice invited comments by the public regarding the request, by the ICAPCD, to exclude the measured concentrations of 172 $\mu\text{g}/\text{m}^3$, 163 $\mu\text{g}/\text{m}^3$ and 228 $\mu\text{g}/\text{m}^3$, which occurred on April 14, 2016 in Brawley, Niland and Westmorland. The final closing date for comments was February 12, 2018. **Appendix A** contains a copy of the public notice affidavit along with any comments received by the ICAPCD for submittal as part of the demonstration (40 CFR §50.14(c)(3)(v)).

I.2.d Documentation submittal supporting an Exceptional Event Flag (40 CFR §50.14(c)(3)(i))

States that have flagged data as a result of an exceptional event and who have requested an exclusion of said flagged data are required to submit a demonstration that justifies the data exclusion to the USEPA in accordance with the due date established by USEPA during the INPEE process (40 CFR §50.14(c)(2)). Currently, bi-weekly meetings between USEPA, CARB and Imperial County are set to discuss each flagged exceedance for 2016.

The ICAPCD, after the close of the comment period and after consideration of the comments will submit this demonstration along with all required elements, including received comments and responses to USEPA Region 9 in San Francisco, California. The submittal of the April 14, 2016 demonstration will have a regulatory impact upon the development and ultimate submittal of the PM_{10} State Implementation Plan for Imperial County in 2018.

I.2.e Necessary demonstration to justify an exclusion of data under (40 CFR §50.14(c)(3)(iv))

- A This demonstration provides evidence that the event, as it occurred on April 14, 2016, satisfies the definition in 40 CFR §50.1(j) and (k) for an exceptional event.
 - a The event created the meteorological conditions that entrained emissions and caused the exceedance.
 - b The event clearly “affects air quality” such that there is the existence of a clear causal relationship between the event and the exceedance.
 - c Analysis demonstrates that the event-influenced concentrations compared to concentrations at the same monitor at other times supports the clear causal relationship.
 - d The event “is not reasonably controllable and not reasonably preventable.”
 - e The event is “caused by human activity that is unlikely to recur at a particular location or [is] a natural event.”
 - f The event is a “natural event” where human activity played little or no direct causal role.

- B This demonstration provides evidence that the exceptional event affected air quality in Imperial County by demonstrating a clear causal relationship between the event and the measured concentrations in Brawley and Westmorland.
- C This demonstration provides evidence of the measured concentrations to concentrations at the same monitor at other times supporting the clear causal relationship between the event and the affected monitor.

II April 14, 2016 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the April 14, 2016 event unfolded in Imperial County. The subsection elements include

- » A description and map of the geographic setting of the air quality and meteorological monitors
- » A description of Imperial County's climate
- » An overall description of meteorological and air quality conditions on the event day.

II.1 Geographic Setting and Monitor Locations

According to the United States Census Bureau, Imperial County has a total area of 4,482 square miles of which 4,177 square miles is land and 305 square miles is water. Much of Imperial County is below sea level and is part of the Colorado Desert an extension of the larger Sonoran Desert (Figure 2-1). The Colorado Desert not only includes Imperial County but a portion of San Diego County.

**FIGURE 2-1
COLORADO DESERT AREA IMPERIAL COUNTY**



Fig 2-1: 1997 California Environmental Resources Evaluation System. According to the United States Geological Survey (USGS) Western Ecological Research Center the Colorado Desert bioregion is part of the bigger Sonoran Desert Bioregion which includes the Colorado Desert and Upper Sonoran Desert sections of California and Arizona, and a portion of the Chihuahuan Basin and Range Section in Arizona and New Mexico (Forest Service 1994)

A notable feature in Imperial County is the Salton Sea, which is at approximately 235 feet below sea level. The Chocolate Mountains are located east of the Salton Sea and extend in a northwest-southeast direction for approximately 60 miles (**Figure 2-2**). In this region, the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect the northern-most extensions of the East Pacific rise. Consequently, the region is subject to earthquakes and the crust is being stretched, resulting in a sinking of the terrain over time.

FIGURE 2-2
SURROUNDING AREAS OF THE SALTON SEA



Fig 2-2: Image courtesy of the Image Science and Analysis Laboratory NASA Johnson Space Center, Houston Texas

All of the seven incorporated cities, including the unincorporated township of Niland, are surrounded by agricultural fields to the north, east, west and south (**Figure 2-6**). Together, the incorporated cities, including Niland, and the agricultural fields make what is known as the Imperial Valley. Surrounding the Imperial Valley are desert areas found on the eastern and western portions of Imperial County.

The desert area, found within the western portion of Imperial County is of note because of its border with San Diego County. From west to east, San Diego County stretches from the Pacific Ocean to its boundary with Imperial County. San Diego County has a varied topography. On its western side is 70 miles (110 km) of coastline. Most of San Diego between the coast and the Laguna Mountains consists of hills, mesas, and small canyons. Snow-capped (in winter)

mountains rise to the northeast, with the Sonoran Desert to the far east. Cleveland National Forest is spread across the central portion of the county, while the Anza-Borrego Desert State Park occupies most of the northeast. The southeastern portion of San Diego County is comprised of distinctive Peninsular mountain ranges. The mountains and deserts of San Diego comprise the eastern two-thirds of San Diego County and are primarily undeveloped back country with a native plant community known as chaparral. Of the nine major mountain ranges within San Diego County, the In-Ko-Pah Mountains and the Jacumba Mountains border Mexico and Imperial County.

Both mountain ranges provide the distinctive weathered dramatic piles of residual boulders that can be seen while driving Interstate 8 from Imperial County through Devil's Canyon and In-Ko-Pah Gorge. Interstate 8 runs along the US border with Mexico from San Diego's Mission Bay to just southeast of Casa Grande Arizona.

FIGURE 2-3
JACUMBA PEAK



Fig 2-3: The Jacumba Mountains reach an elevation of 4,512 feet (1,375 m) at Jacumba Peak, near the southern end of the chain. Source: Wikipedia at https://en.wikipedia.org/wiki/Jacumba_Mountains

Northwest and northeast of the Jacumba Mountains is the Tierra Blanca Mountains, the Sawtooth Mountains and Anza-Borrego Desert State Park. Within the mountain ranges and the Anza-Borrego Desert State Park, there exists the Vallecito Mountains, the Carrizo Badlands, the Carrizo Impact Area, Coyote Mountains and the Volcanic Hills to name of few. Characteristically, these areas all have erosion that has occurred over time that extends from the Santa Rosa Mountains into northern Baja California in Mexico. For example, the Coyote Mountains consists of sand dunes left over from the ancient inland Sea of Cortez. Much of the terrain is still loose dirt, interspersed with sandstone and occasional quartz veins. The nearest community to the Coyote Mountain range is the community of Ocotillo. Of interest are the fossilized and hollowed out sand dunes that produce wind caves.

FIGURE 2-4
ANZA-BORREGO DESERT STATE PARK
CARRIZO BADLANDS



Fig 2-4: View southwest across the Carrizo Badlands from the Wind Caves in Anza-Borrego Desert State Park. Source: Wikipedia at https://en.wikipedia.org/wiki/Carrizo_Badlands

The Carrizo Badlands, which includes the Carrizo Impact Area used by the US Navy as an air-to-ground bombing range during World War II and the Korean War, lies within the Anza-Borrego Desert State Park. The Anza-Borrego Desert State Park is located within the Colorado Desert, is the largest state park in California occupying eastern San Diego County, reaching into Imperial and Riverside counties. The two communities within Anza-Borrego Desert State Park are Borrego Springs and Shelter Valley.

The Anza-Borrego Desert State Park lies in a unique geologic setting along the western margin of the Salton Trough. The area extends north from the Gulf of California to San Geronio Pass and from the eastern rim of the Peninsular Ranges eastward to the San Andreas Fault zone along the far side of the Coachella Valley. The Anza-Borrego region changed gradually over time from intermittently being fed by the Colorado River Delta to dry lakes and erosion from the surrounding mountain ranges. The area located within the southeastern and northeastern section of San Diego County is a source of entrained fugitive dust emissions that affect Imperial County when westerly winds funnel through the unique landforms causing in some cases wind tunnels that cause increases in wind speeds.

Historical observations have indicated that the desert slopes and mountains of San Diego are a source of fugitive emissions along with those deserts located to the east and west of Imperial County, which extend into Mexico (Sonoran Desert, **Figure 2-7**). Combined, the desert areas and mountains of San Diego and the desert areas that extend into Mexico are sources of dust emissions, which affect the Imperial County during high wind events.

FIGURE 2-5
ANZA-BORREGO DESERT STATE PARK
DESERT VIEW FROM FONT'S POINT



Fig 2-5: Desert view from Font's Point. Source: Font's Point Anza-Borrego Photographed by and copyright of (c) David Corby; Wikipedia at https://en.wikipedia.org/wiki/Anza-Borrego_Desert_State_Park

FIGURE 2-6
LOCATION AND TOPOGRAPHY OF IMPERIAL COUNTY



Fig 2-6: Depicts the seven incorporated cities within Imperial Valley - City of Calipatria, City of Westmorland, City of Brawley, City of Imperial, City of El Centro, City of Holtville, and the City of Calexico. Niland is unincorporated. Mexicali, Mexico is to the south

FIGURE 2-7
DESERTS IN CALIFORNIA, YUMA AND MEXICO

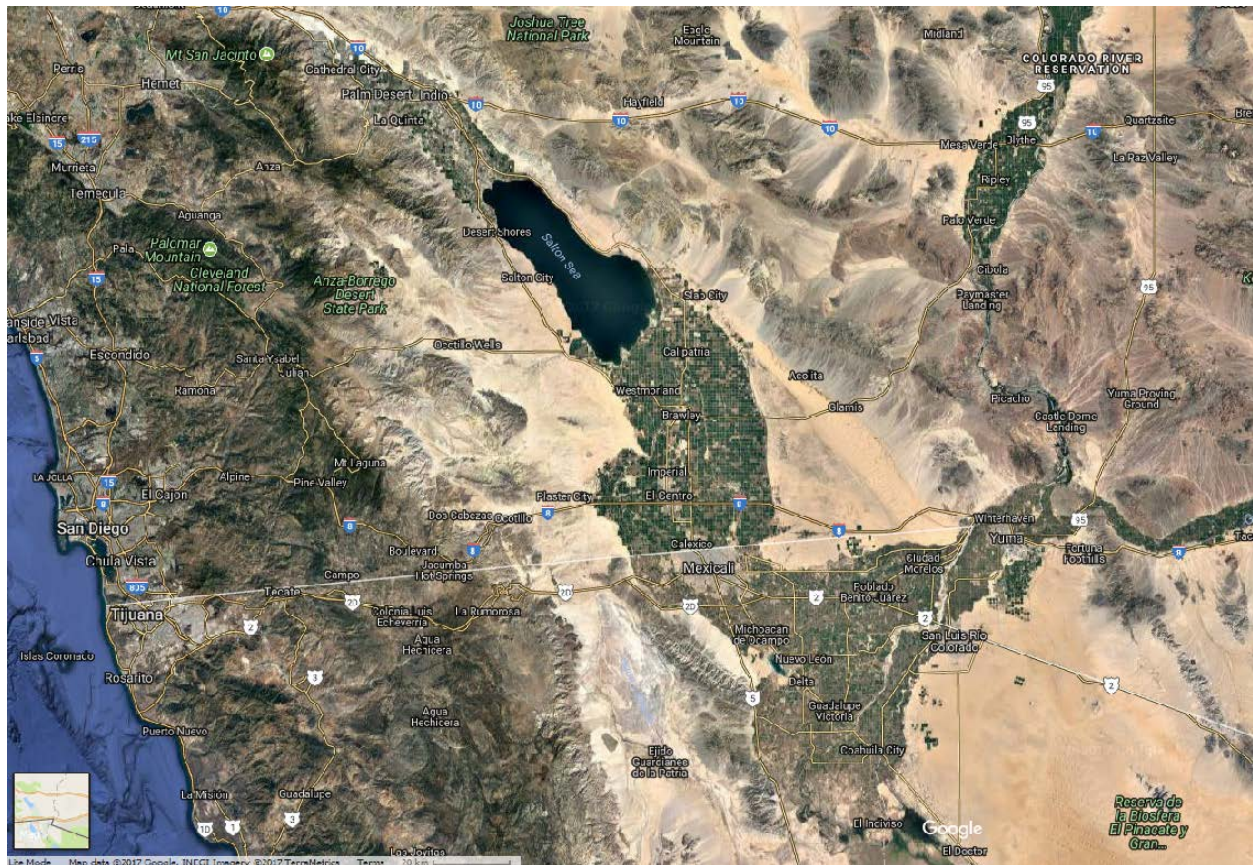


Fig 2-7: Depicts the Sonoran Desert as it extends from Mexico into Imperial County.
 Source: Google Earth Terra Metrics

The air quality and meteorological monitoring stations used in this demonstration are shown in **Figure 2-8**. Of the five SLAMS within Imperial County, four stations measure both meteorological and air quality data. These SLAMS are located in Calexico, El Centro, Westmorland, and Niland; the station located in Brawley only measures air quality. Other air monitoring stations measuring air quality and meteorological data used for this demonstration include stations in eastern Riverside County, southeastern San Diego County and southwestern Arizona (Yuma County) (**Figure 2-8**).

As mentioned above, the PM₁₀ exceedances on April 14, 2016, occurred at the Brawley and Westmorland stations. The Brawley and Westmorland stations are regarded as the “northern” monitoring sites within the Imperial County air monitoring network. In order to properly analyze the contributions from meteorological conditions occurring on April 14, 2016, other meteorological sites were used in this demonstration which include airports in eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), Imperial County, and other sites relevant to the wind event, such as within northern Mexico. (**Figure 2-8**).

FIGURE 2-8
MONITORING SITES IN AND AROUND IMPERIAL COUNTY

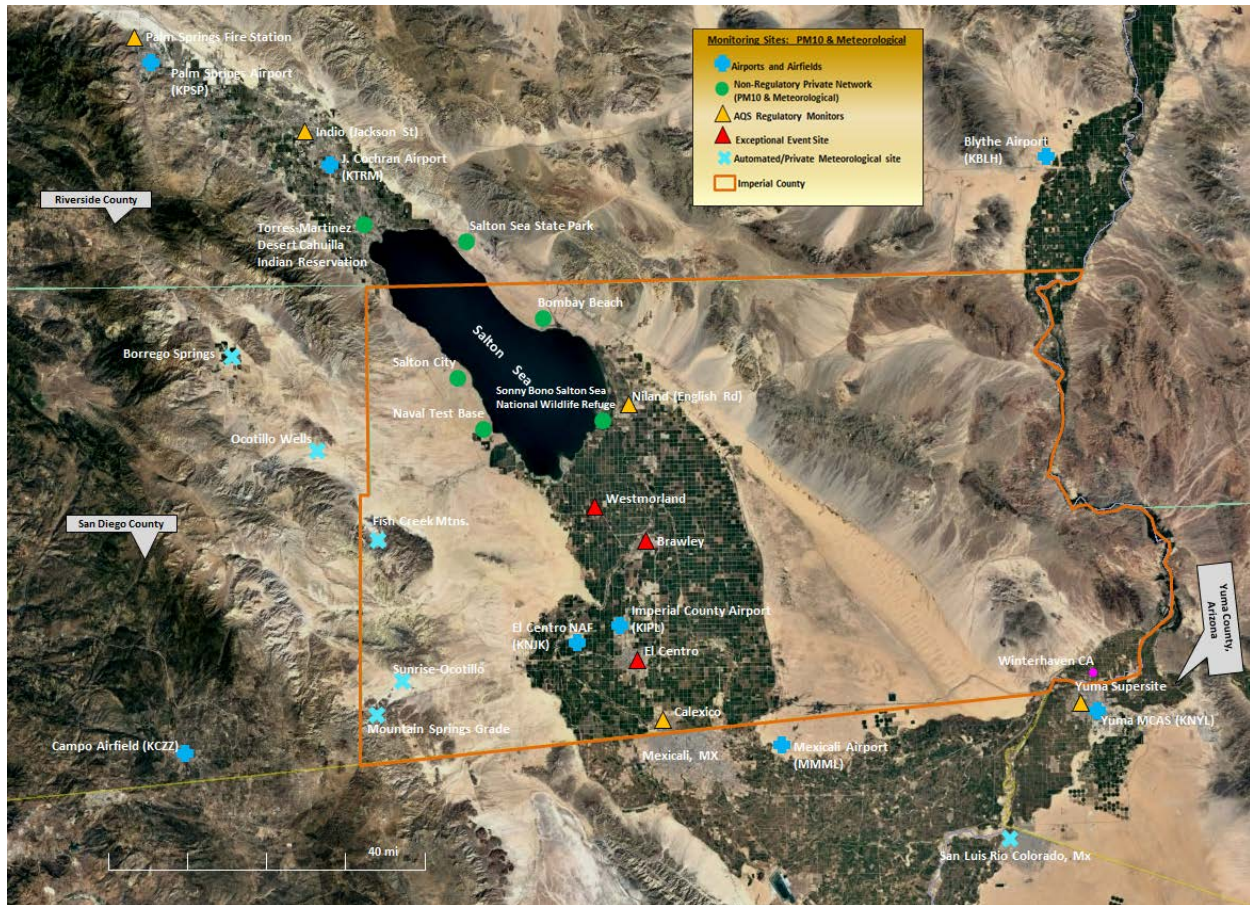


Fig 2-8: Depicts a select group of meteorological and PM₁₀ monitoring sites in Imperial County, eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), and northern Mexico. The image provides the location of potential sites used to gather data in support of an Exceptional Event Demonstration. Source: Google Earth

In addition to meteorological sites, there are non-regulatory PM₁₀ sites located around the Salton Sea that maybe referenced as an aid to help the reader understand the direction and velocity of winds that affect Imperial County. Unless, otherwise specifically indicated concentration references do not imply emissions from the surrounding playa of the Salton Sea. Three sites, in specific, are the Salton City air monitoring station, the Naval Test Base air monitoring station and the Sonny Bono air monitoring station. These stations are privately owned and non-regulatory (**Figures 2-9 to 2-12**). The Salton City station is located 33.27275°N latitude and 115.90062°W longitude, on the western edge of the Salton Sea (**Figure 2-9**). The station abuts a water reservoir along the Salton Sea with surrounding chaparral vegetation and unpaved open areas and roads. The Naval Test Base station is located 33.16923°N latitude and 115.85593°W longitude, on the southwestern edge of the Salton Sea (**Figure 2-11**). The station sits on an abandoned US Military site, still owned by the Department of Defense. Unlike the Salton City station, light chaparral

vegetation and sandy open dune areas surround the Naval Test Base station. Directly to the west of the station is an orchard. The Sonny Bono station is located 33.17638°N latitude and 115.62310°W longitude, on the southern portion of the Salton Sea within the Sonny Bono Salton Sea Wildlife Refuge. The Sonny Bono Salton Sea National Wildlife Refuge is 40 miles north of the Mexican border at the southern end of the Salton Sea within the Sonoran Desert. The Refuge has two separate managed units, 18 miles apart. Each unit contains wetland habitats, farm fields, and tree rows. The land of the Salton Sea Refuge is flat, except for Rock Hill, a small, inactive volcano, located near Refuge Headquarters. Bordering the Refuge is the Salton Sea on the north and farmlands on the east, south, and west.

FIGURE 2-9
SALTON CITY AIR MONITORING STATION

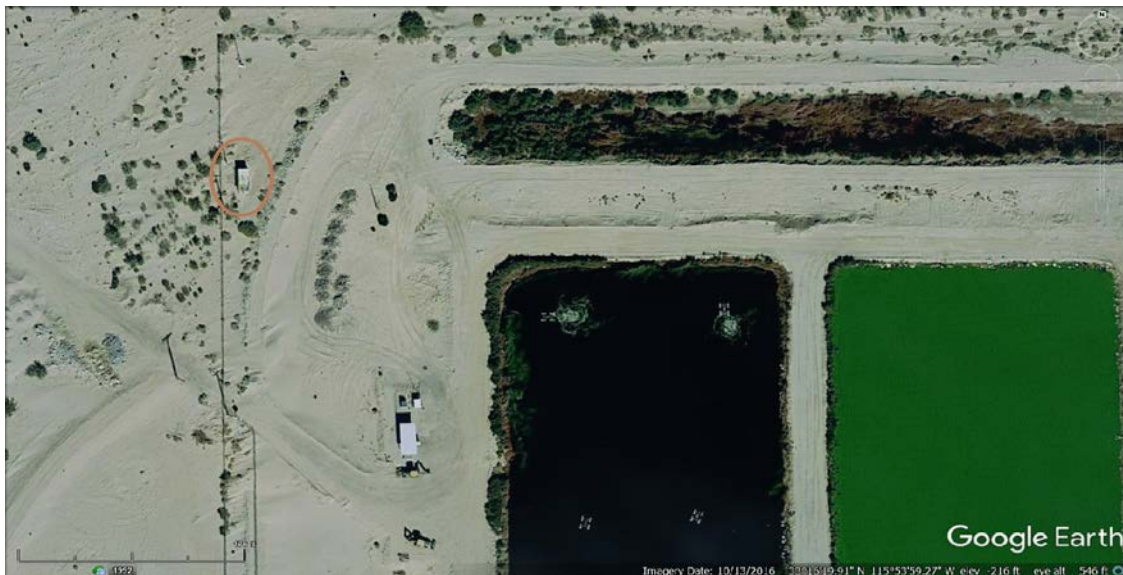


Fig 2-9: Depicts the Salton City air monitoring (circled) site operated by a private entity. Site photos can be seen at the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-10
SALTON CITY AIR MONITORING STATION
WEST



Fig 2-10: Photograph taken by the California Air Resources Board audit team in 2017. The photograph is taken from the west facing the probe.
https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-11
NAVAL TEST BASE AIR MONITORING STATION



Fig 2-11: Depicts the Naval Test Base air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13603&date=17

FIGURE 2-12
NAVAL TEST BASE AIR MONITORING STATION
WEST



Fig 2-12: Photograph taken by the California Air Resources Board audit team in 2017. The photograph is taken from the west facing the probe.

https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-13
SONNY BONO AIR MONITORING STATION



Fig 2-13: Depicts the Sonny Bono air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-14
SONNY BONO SALTON SEA NATIONAL WILDLIFE REFUGE

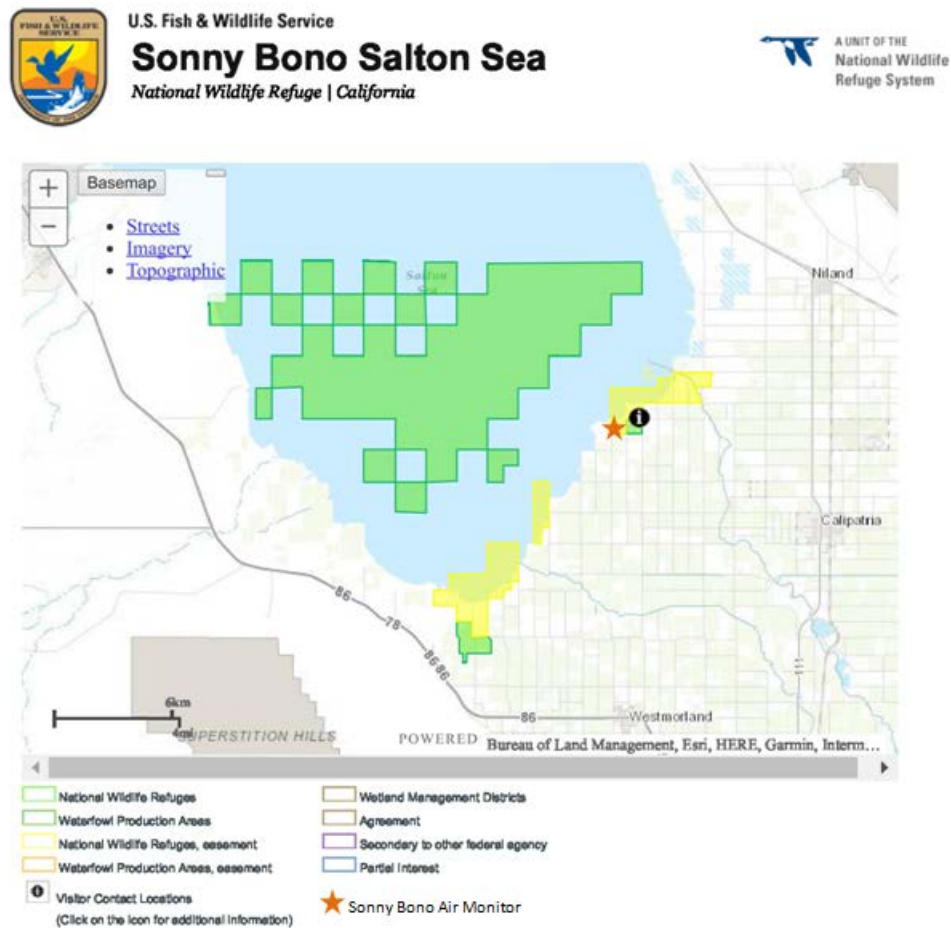


Fig 2-14: The Sonny Bono Wildlife Refuge has about 2,000 acres that are farmed and managed for wetlands. In 1998, the Refuge was renamed after Congressman Sonny Bono, who helped inform the U.S. Congress of the environmental issues facing the Salton Sea as well as acquiring funding for this Refuge to help it respond to avian disease outbreaks and other habitat challenges at the Salton Sea. Source:

https://www.fws.gov/refuge/Sonny_Bono_Salton_Sea/about.html

TABLE 2-1
MONITORING SITES IN IMPERIAL COUNTY, RIVERSIDE COUNTY AND ARIZONA
APRIL 14, 2016

Monitor Site Name	*Operator	Monitor Type	AQS ID	AQS PARAMETER CODE	ARB Site Number	Elevation (meters)	24-hr PM ₁₀ (µg/m ³) Avg	1-hr PM ₁₀ (µg/m ³) Max	**Time of Max Reading	Max Wind Speed (mph)	**Time of Max Wind Speed
IMPERIAL COUNTY											
Brawley-Main Street #2	ICAPCD	Hi-Vol Gravimetric	06-025-0007	(81102)	13701	-15	-	-	-	-	-
		BAM 1020					228	995	17:00		
Calexico-Ethel Street	CARB	BAM 1020	06-025-0005	(81102)	13698	3	62	174	14:00	13.5	15:00
El Centro-9th Street	ICAPCD	BAM 1020	06-025-1003	(81102)	13694	9	48	126	17:00	16.5	19:00
Niland-English Road	ICAPCD	Hi-Vol Gravimetric	06-025-4004	(81102)	13997	-57	-	-	-	25.9	17:00
		BAM 1020					118.5	434	21:00		
Westmorland	ICAPCD	BAM 1020	06-025-4003	(81102)	13697	-43	163	981	17:00	17.8	17:00
RIVERSIDE COUNTY											
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	(81102)	33137	174	25.8	42	15:00	12	17:00
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	(81102)	33157	1	81.3	255	07:00	16	16:00
ARIZONA – YUMA											
Yuma Supersite	ADEQ	TEOM	04-027-8011	(81102)	N/A	60	63.2	236	20:00	-	-

*CARB = California Air Resources Board

*ICAPCD = Air Pollution Control District, Imperial County

*SCAQMD = South Coast Air Management Quality District

*ADEQ = Arizona Department of Environmental Quality

Time represents the actual time/hour of the measurement in question according to the zone time (PST unless otherwise noted**)

II.2 Climate

As mentioned above, Imperial County is part of the Colorado Desert, which is a subdivision of the larger Sonoran Desert (**Figure 2-15**) encompassing approximately 7 million acres (28,000 km²). The desert area encompasses Imperial County and includes parts of San Diego County, Riverside County, and a small part of San Bernardino County.

FIGURE 2-15
SONORAN DESERT REGION

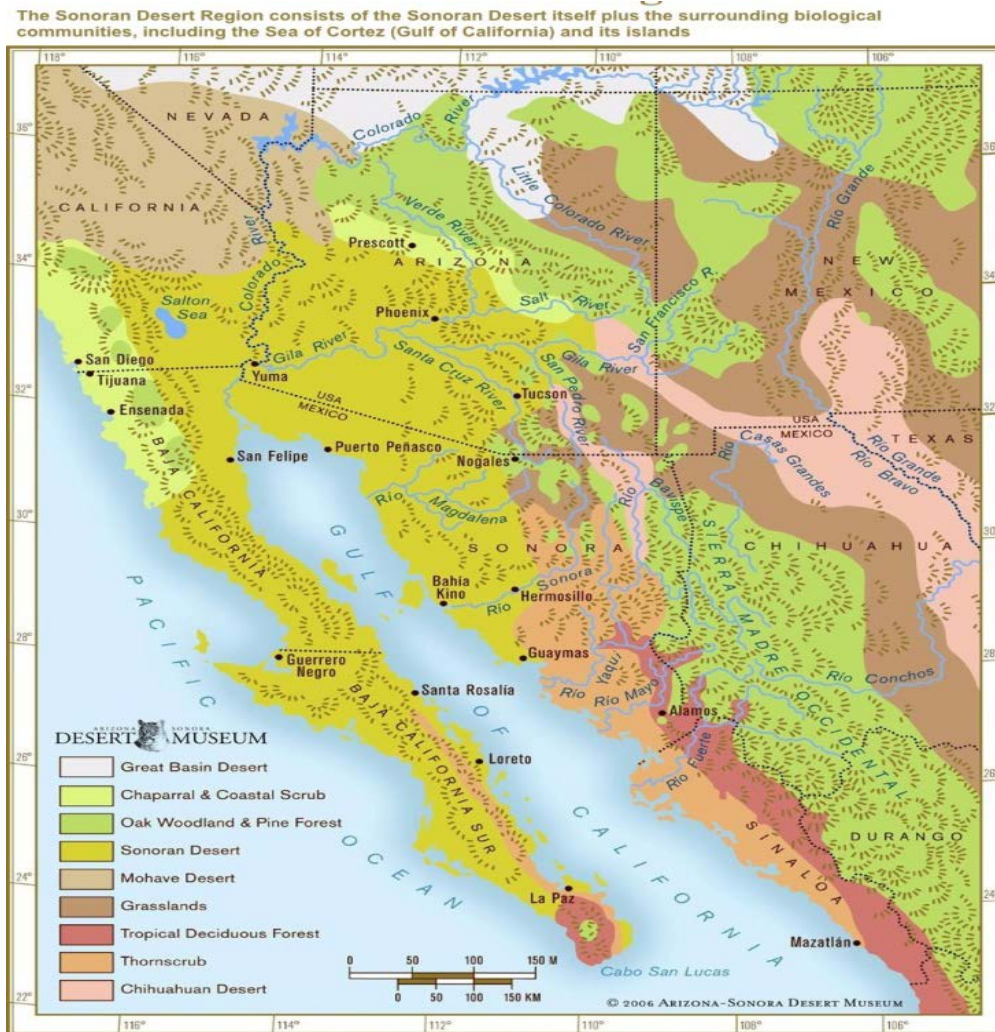


Fig 2-15: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at <http://desertmuseum.org/center/map.php>

The majority of the Colorado Desert lies at a relatively low elevation, below 1,000 feet (300 m), with the lowest point of the desert floor at 275 feet (84 m) below sea level at the Salton Sea. Although the highest peaks of the Peninsular Range reach elevations of nearly 10,000 feet (3,000 m), most of the region's mountains do not exceed 3,000 feet (910 m).

In the Colorado Desert (Imperial County), the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect to the northern-most extensions of the East Pacific Rise. Consequently, the region is subject to earthquakes, and the crust is being stretched, resulting in a sinking of the terrain over time.

The Colorado Desert's climate distinguishes it from other deserts. The region experiences greater summer daytime temperatures than higher-elevation deserts and almost never experiences frost. In addition, the Colorado Desert experiences two rainy seasons per year (in the winter and late summer), especially toward the southern portion of the region which includes a portion of San Diego County. The Colorado Desert portion of San Diego County receives the least amount of precipitation. Borrego Springs, the largest population center within the San Diego desert region averages 5 inches of rain with a high evaporation rate. By contrast, the more northerly Mojave Desert usually has only winter rains.

The west coast Peninsular Ranges, or other west ranges, of Southern California—northern Baja California, block most eastern Pacific coastal air and rains, producing an arid climate. Other short or longer-term weather events can move in from the Gulf of California to the south, and are often active in the summer monsoons. These include remnants of Pacific hurricanes, storms from the southern tropical jet stream, and the northern Inter Tropical Convergence Zone (ITCZ).

The arid nature of the region is demonstrated when historic annual average precipitation levels in Imperial County average 2.64" (**Figure 2-16**). During the 12-month period prior to April 14, 2016 Imperial County recorded total annual precipitation of only 1.3 inches. Such arid conditions, as those preceding the event, result in soils that are particularly susceptible to particulate suspension by the elevated gusty winds.

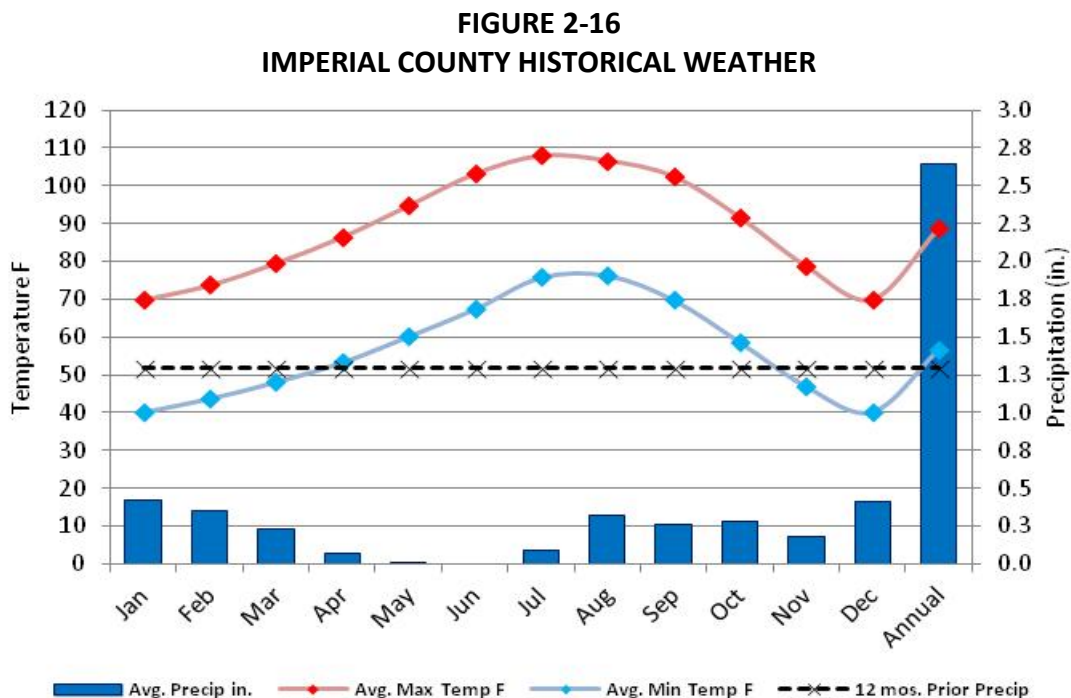


Fig 2-16: Historical Imperial County weather. Prior to April 14, 2016, the region had suffered abnormally low total precipitation of 1.3 inches. Average annual precipitation is 2.64 inches. Meteorological data courtesy of Western Regional Climate Center (WRCC) and Weather Underground <http://www.wrcc.dri.edu/cgi-bin/climain.pl?ca2713>

The NWS explains that the speed of any wind resulting from a weather system is directly proportional to the change in air pressure, called a pressure gradient, such that when the pressure gradient increases so does the speed of the wind.⁴ Because the pressure gradient is just the difference in pressure between high and low pressure areas, changes in weather patterns may recur seasonally.

Typically high pressure brings clear skies and with no clouds there is more incoming shortwave solar radiation causing temperatures to rise. When surface winds become light, the cooling of the air produced directly under a high pressure system can lead to a buildup of particulates in urban areas under an elongated region of relatively high atmospheric pressure or ridge causing widespread haze. Conversely, a trough is an elongated region of relatively low atmospheric pressure often associated with fronts. Troughs may be at the surface, or aloft under various conditions. Most troughs bring clouds, showers, and a wind shift, particularly following the passage of the trough.

While windblown dust events in Imperial County during the summer monsoon season are often due to outflow winds from thunderstorms, windblown dust events in the fall, winter, and spring are usually due to strong winds associated with low-pressure systems and cold fronts moving southeast across California. These winds are the result of strong surface pressure gradients between the approaching low-pressure system, accompanying cold front, and higher pressure ahead of it. As the low-pressure system and cold front approaches and passes, gusty southwesterly winds typically shift to northwesterly causing variable west winds. These strong winds entrain dust into the atmosphere and transport it over long distances, especially when soils are arid.

II.3 Event Day Summary

The exceptional event for April 14, 2016 was caused when a large and deep upper level trough moved southeastward from the Pacific Northwest toward the Great Basin. As the low deepened it strengthened surface gradients which promoted a robust onshore flow. This in turn generated high winds across the mountains and deserts of southeastern California and into portions of western Arizona. A mostly dry cold front accompanied the weather system. Post-frontal westerly winds up to 30 mph with gusts reaching 36 mph swept through Imperial County. The high winds entrained fugitive windblown dust over and through the mountains and deserts within southeastern California and into Imperial County.

Figures 2-17 through 2-19 show the upper level low and the tightening of the surface gradient as the system dug southward over southern California. The deepening of the low caused a tightening of the pressure gradient at the surface, which led to conditions conducive to high winds across southeastern California.

⁴ NWS JetStream – Origin of Wind <http://www.srh.noaa.gov/jetstream/synoptic/wind.html>

FIGURE 2-17
UPPER LEVEL TROUGH APPROACHES REGION

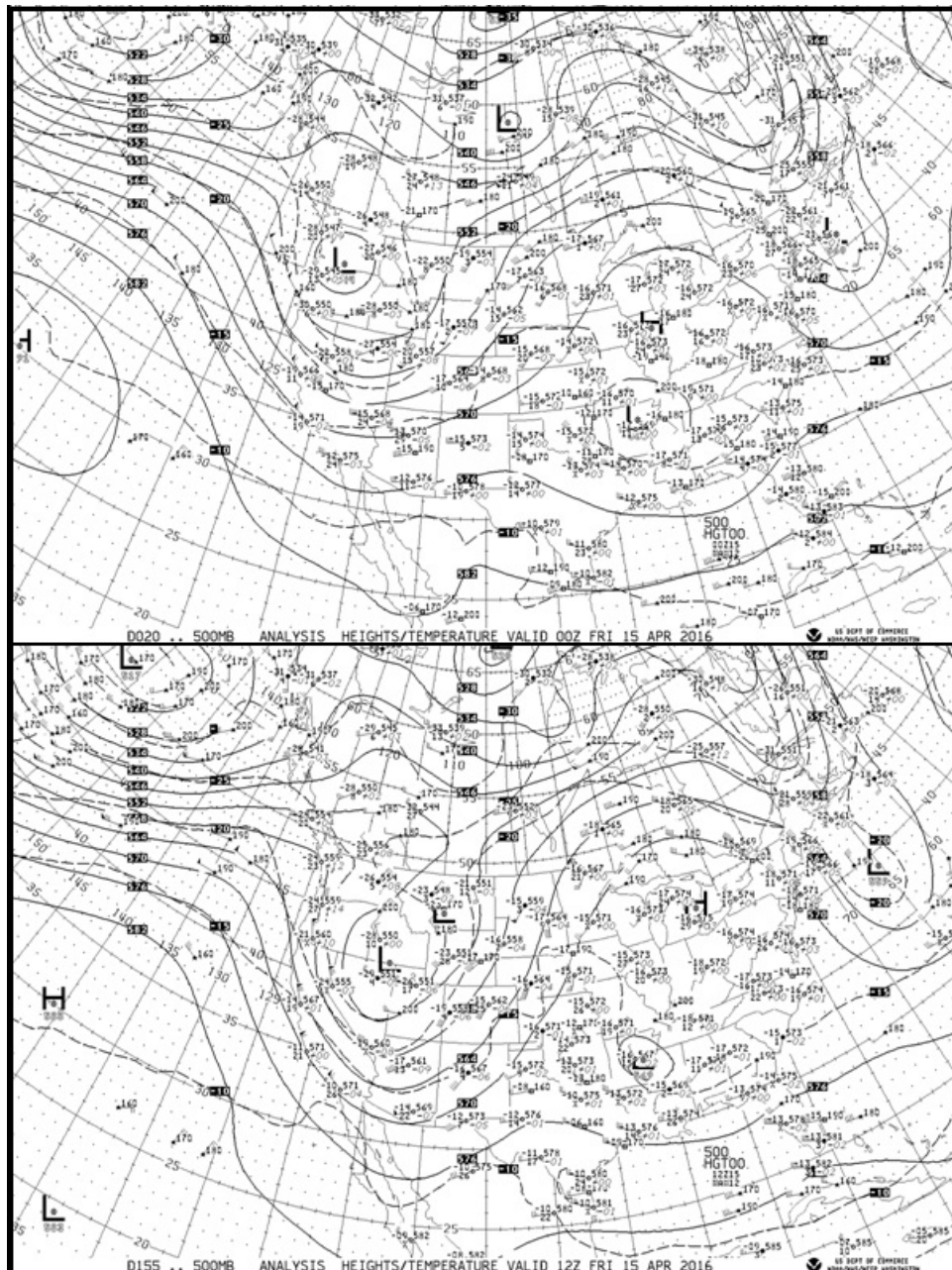


Fig 2-17: A pair of 500mb height maps show the movement of the trough as it dropped out of the Pacific Northwest (top image, 1600 PST) and moved towards the Great Basin (bottom image, 0400 PST April 15, 2016). The low strengthened surface gradients, which in turn led to high winds across southeastern California. Source: NWS DIFAX Weather Map archive, Colorado State University;

<http://archive.atmos.colostate.edu/data/misc/QHTA11/1604>

FIGURE 2-18
SURFACE GRADIENT TIGHTENS

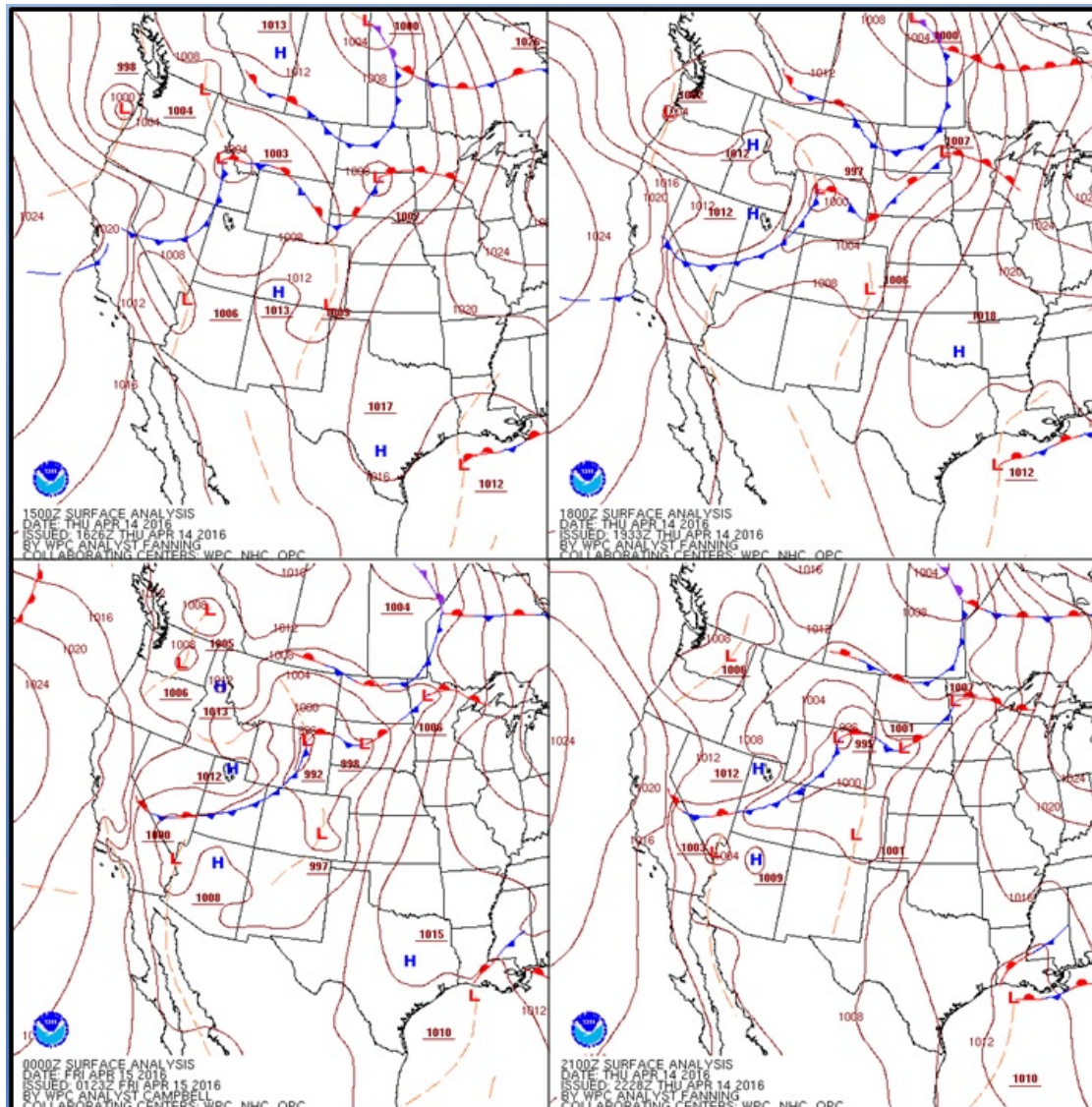


Fig 2-18: A quad of surface analysis maps shows a moderate packing of the gradient. Clockwise, from top left: 0700 PST; 1000 PST; 1300 PST; 1600 PST, April 14, 2016. Source: Weather Prediction Center Surface Analysis Archive

FIGURE 2-19
SURFACE GRADIENT REMAINS PACKED

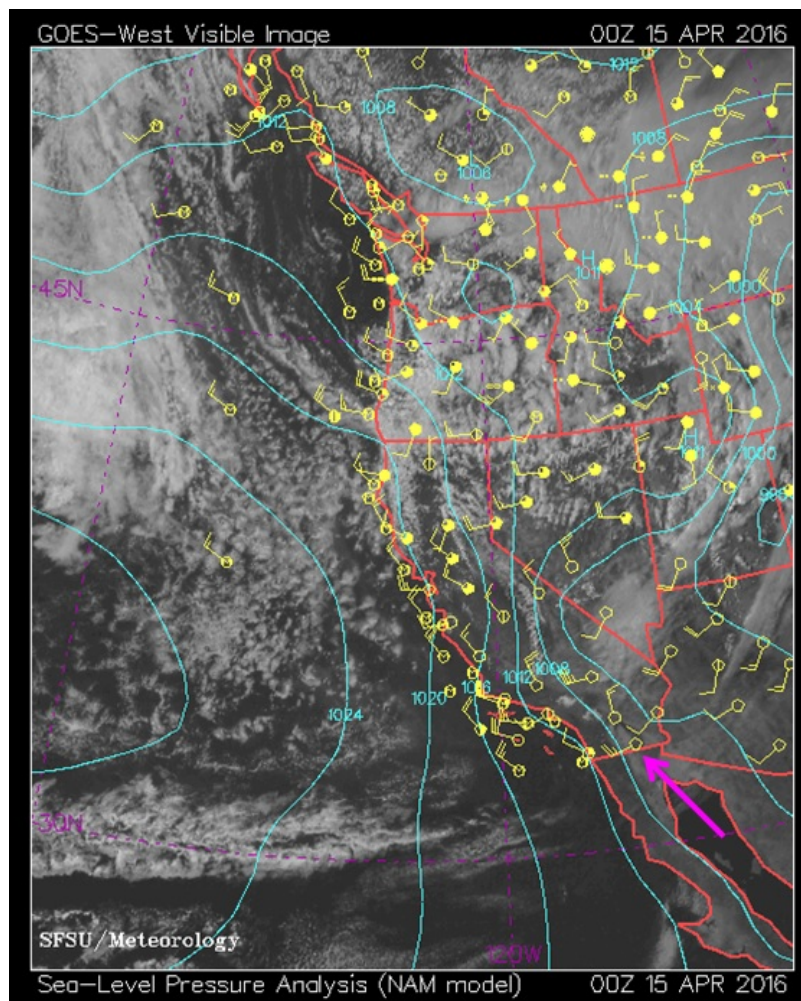


Fig 2-19: A GOES-W visible satellite (1600 PST) image with wind barbs depicting the general direction and speed of wind across Imperial County (see arrow). The wind barb indicates southwest winds of at least 28.8 mph. Source: SFSU Department of Earth & Climate Sciences and the California Regional Weather Server;
http://www.wpc.ncep.noaa.gov/archives/web_pages/sfc/sfc_archive.php

Figure 2-20 visualizes the ramp up of winds during the event day. Based on meteorological data collected from Imperial County Airport (KIPL) and El Centro NAF (KNJK), winds were light and mostly westerly to northerly up to mid-day. By early afternoon winds had shifted solidly westerly. Gusts and winds increased at KNJK and KIPL until reaching a peak mid to late afternoon. KNJK recorded seven hours of winds above the 25 mph threshold, with five hours of gusts at or above 31 mph. KIPL measured three hours of winds at or above the 25 mph wind threshold, with seven hours of gusts at or above 30 mph.

FIGURE 2-20
RAMP UP ANALYSIS APRIL 14, 2016

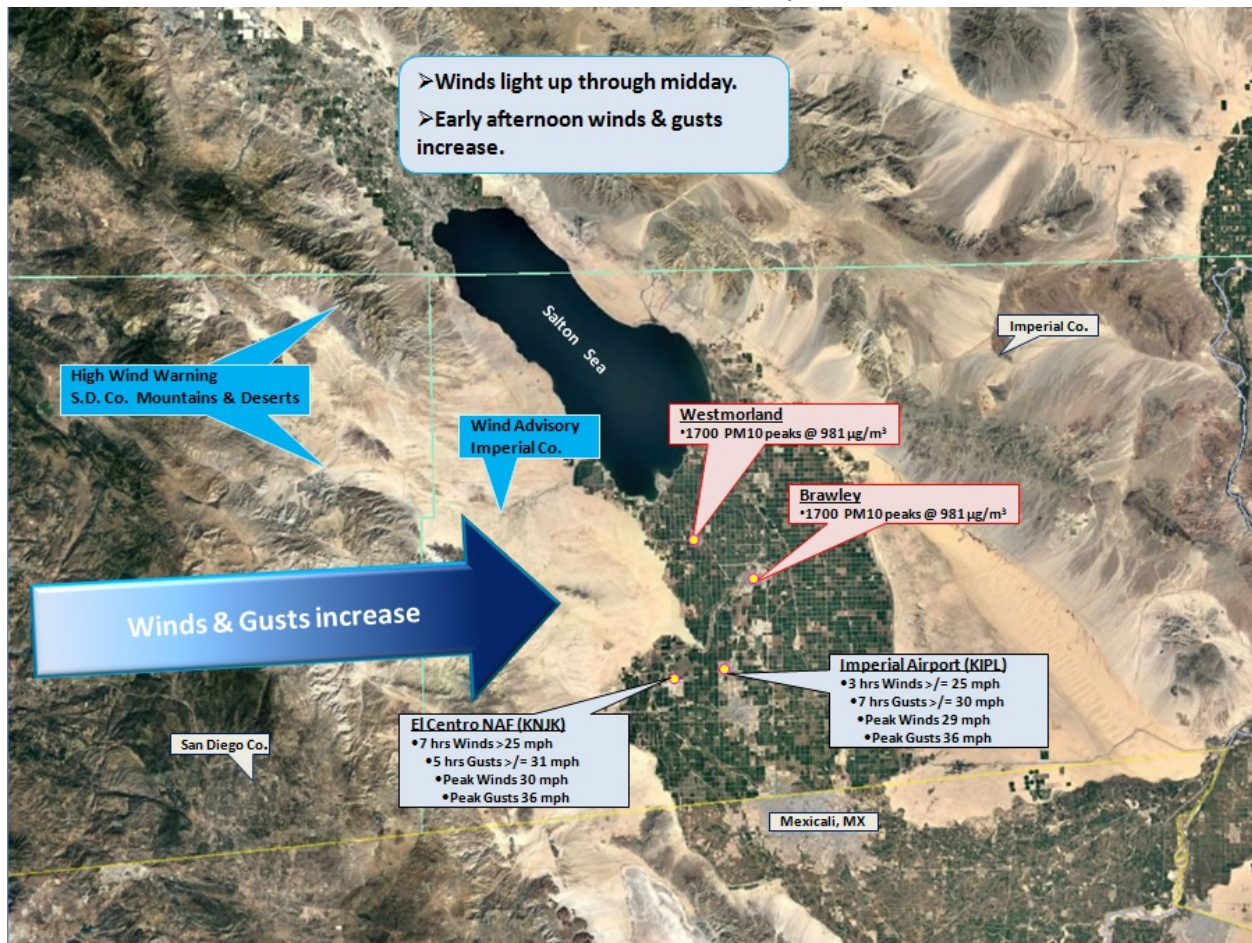


Fig 2-20: Light and variable winds up through midday turned westerly and increased steadily through the afternoon. Entrained fugitive windblown dust reached Imperial County where it caused exceedances at Westmorland and Brawley. Air quality data from the EPA's AQS databank. Wind data from the NCEI's QCLCD system. Google Earth base map

Table 2-2 is a summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, eastern Riverside County, Yuma County, Arizona, and Mexicali, Mexico. For detailed meteorological station, graphs see **Appendix B**.

TABLE 2-2
WIND SPEEDS ON APRIL 14, 2016

Station Monitor	Maximum Wind Speed (WS) (mph)	Wind Direction during Max WS (degrees)	Time of Max Wind Speed	24 hr Maximum Wind Gust (WG) (mph)	Time of Max WG	PM ₁₀ correlated to time of Max Wind Speed		
Airport Meteorological Data						Wstmd	Brly	Nlnd
IMPERIAL COUNTY								
Imperial Airport (KIPL)	29	250	15:53	36	15:53	40	-	24
Naval Air Facility (KNJK)	30	250	17:56	36	15:56	981	995	434
Calexico (Ethel St)	13.5	281	15:00	-	-	40	-	24
El Centro (9th Street)	16.5	268	19:00	-	-	533	995	421
Niland (English Rd)	25.9	258	17:00	-	-	981	995	434
Westmorland	16.8	275	19:00	-	-	533	995	421
RIVERSIDE COUNTY								
Blythe Airport (KBLH)	17	220	17:52	20	15:52	981	995	434
Palm Springs Airport (KPSP)	21	320	15:53	33	16:53	40	-	24
Jacqueline Cochran Regional Airport (KTRM) - Thermal	24	330	21:52	37	22:52	129	725	208
ARIZONA - YUMA								
Yuma MCAS (KNYL)	16	250	17:57	24	17:57	981	995	434
MEXICALI - MEXICO								
Mexicali Int. Airport (MXL)	18.4	280	20:48	-	-	481	503	364

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted

The National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT back trajectory model,⁵ depicted in **Figure 2-21** is a back-trajectory ending at Brawley (red icon) and Westmorland (blue icon) in the six-hours leading up to peak concentrations at both monitors at 1700 PST. It should be noted that modeled winds can differ from local conditions. Data used in the HYSPLIT model has a horizontal resolution of 12 km and is integrated every three hours. Thus, the HYSPLIT model may differ from local observed surface wind speeds and directions.

⁵ The Hybrid Single Particle Lagrangian Integrated Trajectory Model (**HYSPLIT**) is a computer model that is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. It is currently used to compute air parcel trajectories and dispersion or deposition of atmospheric pollutants. One popular use of HYSPLIT is to establish whether high levels of air pollution at one location are caused by transport of air contaminants from another location. HYSPLIT's back trajectories, combined with satellite images (for example, from NASA's [MODIS](#) satellites), can provide insight into whether high air pollution levels are caused by local air pollution sources or whether an air pollution problem was blown in on the wind. The initial development was a result of a joint effort between NOAA and Australia's Bureau of Meteorology. Source: NOAA/Air Resources Laboratory, 2011.

FIGURE 2-21
NOAA HYSPLIT MODEL APRIL 14, 2016

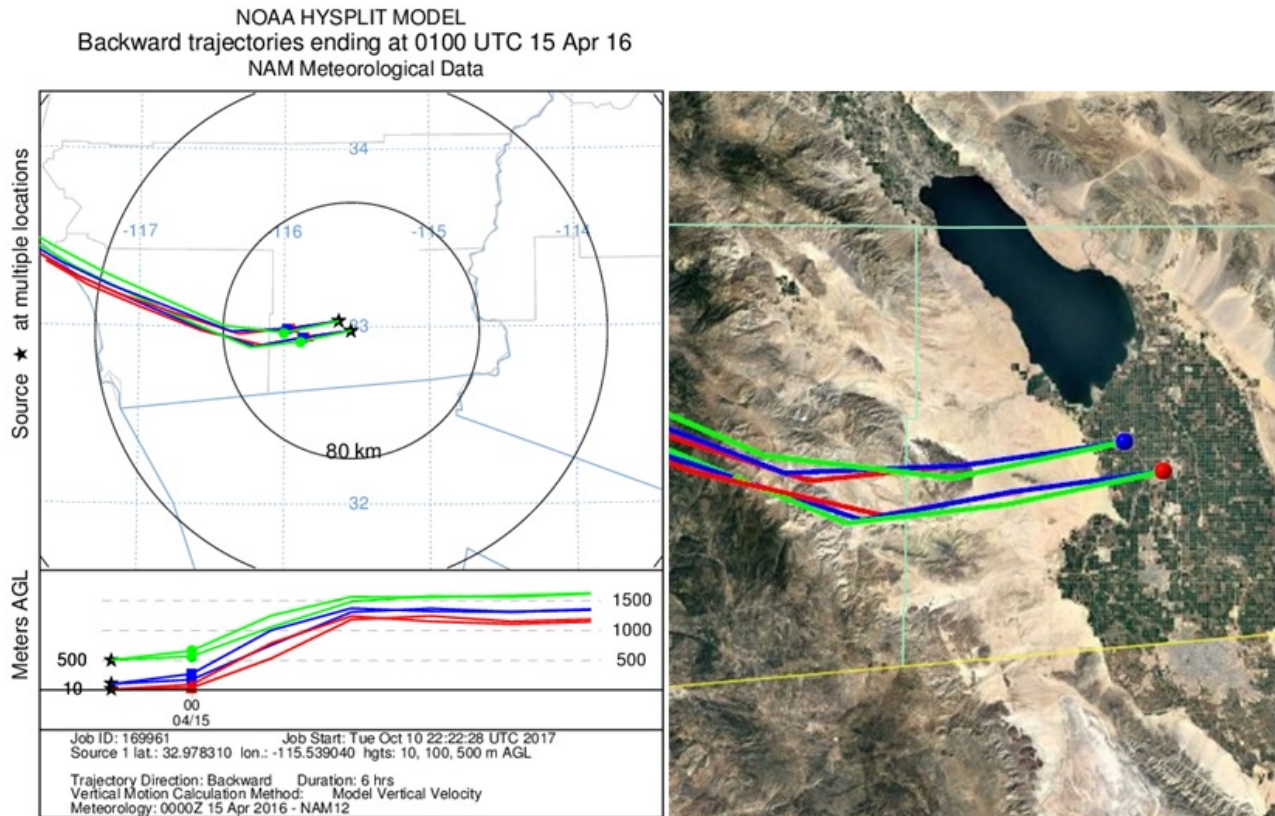


Fig 2-21: A 6-hour back trajectory ending at 1700 PST. This was during the period that both Brawley and Westmorland FEM monitors were reporting high hourly concentrations. Red trajectory indicates air flow at 10 meters AGL (above ground level); blue indicates air flow at 100 m; green indicates air flow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth.

Figures 2-22 and 2-22 illustrate the winds and elevated levels of hourly PM₁₀ concentrations measured in Riverside, Imperial and Yuma Counties for the day before and the day of and after April 14, 2016. The Brawley and Westmorland monitors were affected when gusty west winds that were associated with the passage of a low-pressure system and cold front elevated emissions on April 14, 2016. The Brawley and Westmorland monitors measured the highest elevated concentrations at 17:00 PST just after winds of 25 mph were measured at local airfields.

The resulting entrained dust and accompanying high winds from the system qualify this event as a "high wind dust event".⁶ High wind dust events are considered natural events where the windblown dust is either from solely a natural source or from areas where anthropogenic sources

⁶ Title 40 Code of Federal Regulations part 50: §50.1(p) High wind dust event is an event that includes the high-speed wind and the dust that the wind entrains and transports to a monitoring site.

of windblown dust are controlled with Best Available Control Measures (BACM). The following sections provide evidence that the April 14, 2016 high wind event qualifies as a natural event and that BACM was overwhelmed by the suddenness and intensity of the meteorological event.

FIGURE 2-22
72 HOUR WIND SPEEDS REGIONAL SITES

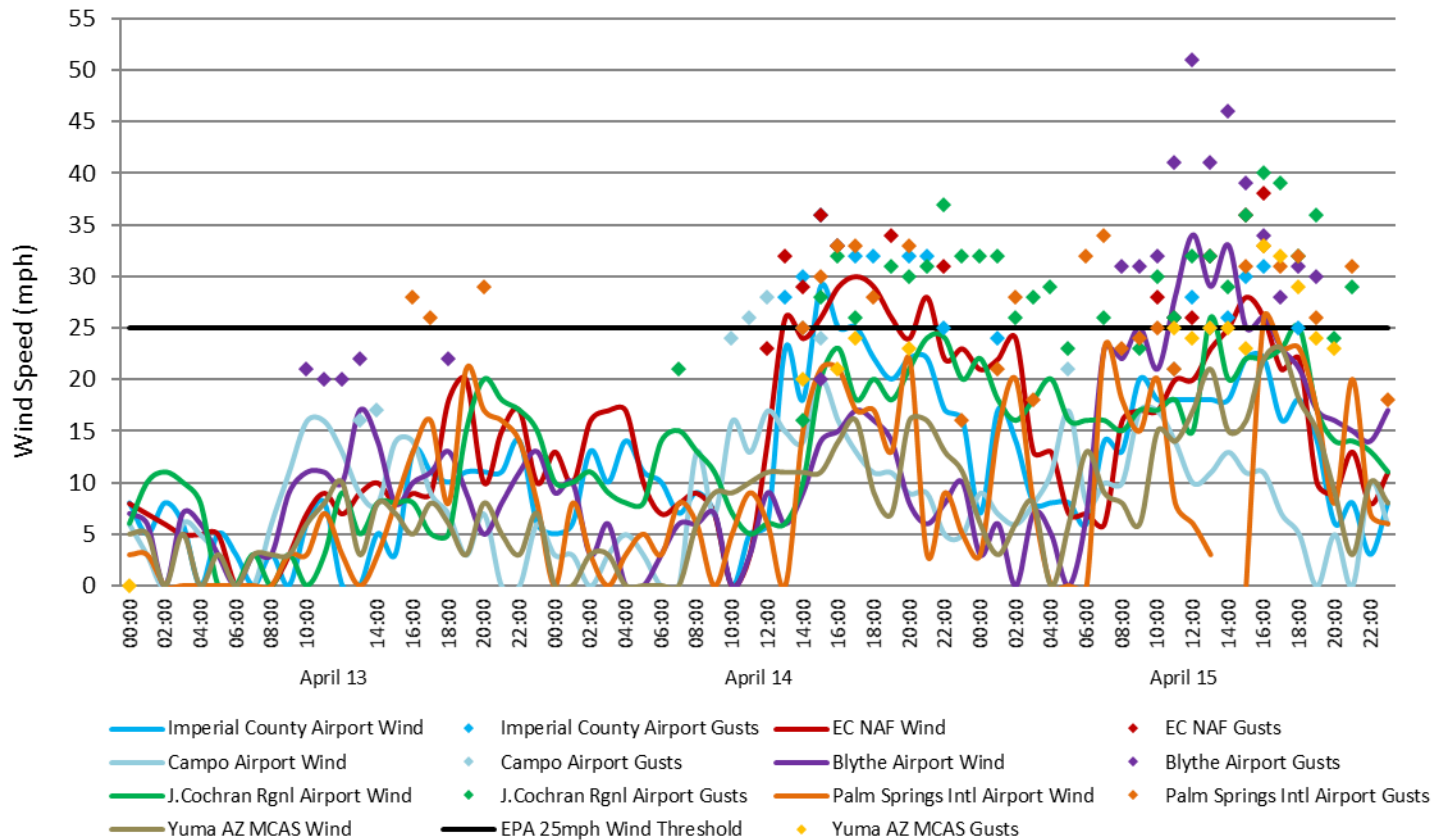


Fig 2-22: The graph illustrates the regional nature of the high winds and the consistent pattern between wind speeds at airfields particularly around 14:00 PST. Both the Imperial County Airport and El Centro NAF measured wind speeds above the 25 mph threshold. Wind Data from the NCEI's QCLCD system. Individual wind station graphs are located in **Appendix B**

FIGURE 2-23
72 HOUR PM₁₀ CONCENTRATIONS AT VARIOUS SITES

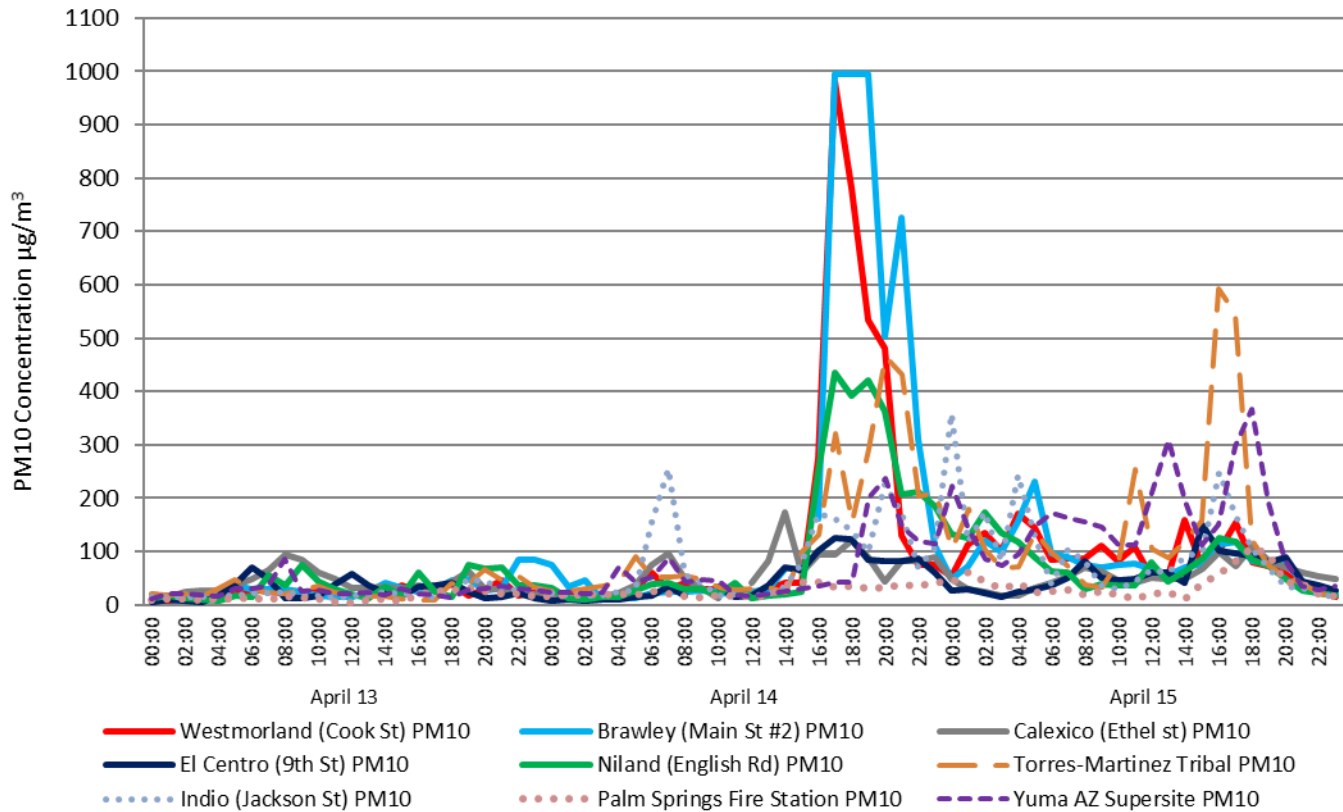


Fig 2-23: Is the graphical representation of the 72 hour relative PM₁₀ concentrations at various sites in California and Arizona. The consistent elevated PM₁₀ concentrations at nearly all sites on April 14, 2016, support the regional impact resulting from the accompanying winds of the weather system. Air quality data from the EPA's AQS data bank

III Historical Concentrations

III.1 Analysis

While naturally occurring high wind events may recur seasonally and at times frequently and qualify for exclusion under the EER, historical comparisons of the particulate concentrations and associated winds provide insight into the frequency of events within an identified area. The following time series plots illustrate that PM₁₀ concentrations measured at the Brawley and Westmorland monitors on April 14, 2016, were compared to non-event and event days demonstrating the variability over several years and seasons. The analysis, also, provides supporting evidence that there exists a clear causal relationship between the April 14, 2016 high wind event and the exceedance measured at the Brawley and Westmorland monitors.

Figures 3-1 through 3-4 show the time series of available FRM and BAM 24-hr PM₁₀ concentrations at the Brawley and Westmorland stations for the period of January 1, 2010 through April 14, 2016. Note that prior to 2013, the BAM data was not considered FEM and was not reported into AQS.⁷ In order to properly establish the variability of the event as it occurred on April 14, 2016, 24-hour averaged PM₁₀ concentrations between January 1, 2010 and April 14, 2016 were compiled and plotted as a time series. All four figures illustrate that the exceedance, which occurred on April 14, 2016, were outside the normal historical concentrations when compared to event and non-event days. Air quality data for all graphs was obtained through the EPA's AQS data bank.

⁷ Pollutant concentration data contained in EPA's Air Quality System (AQS) are required to be reported in units corrected to standard temperature and pressure (25 C, 760 mm Hg). Because the PM₁₀ concentrations prior to 2013 were not reported into the AQS database all BAM (FEM) data prior to 2013 within this report are expressed as micrograms per cubic meter (mg/m³) at local temperature and pressure (LTP) as opposed to standard temperature and pressure (STP, 760 torr and 25 C). The difference in concentration measurements between standard conditions and local conditions is insignificant and does not alter or cause any significant changes in conclusions to comparisons of PM₁₀ concentrations to PM₁₀ concentrations with in this demonstration.

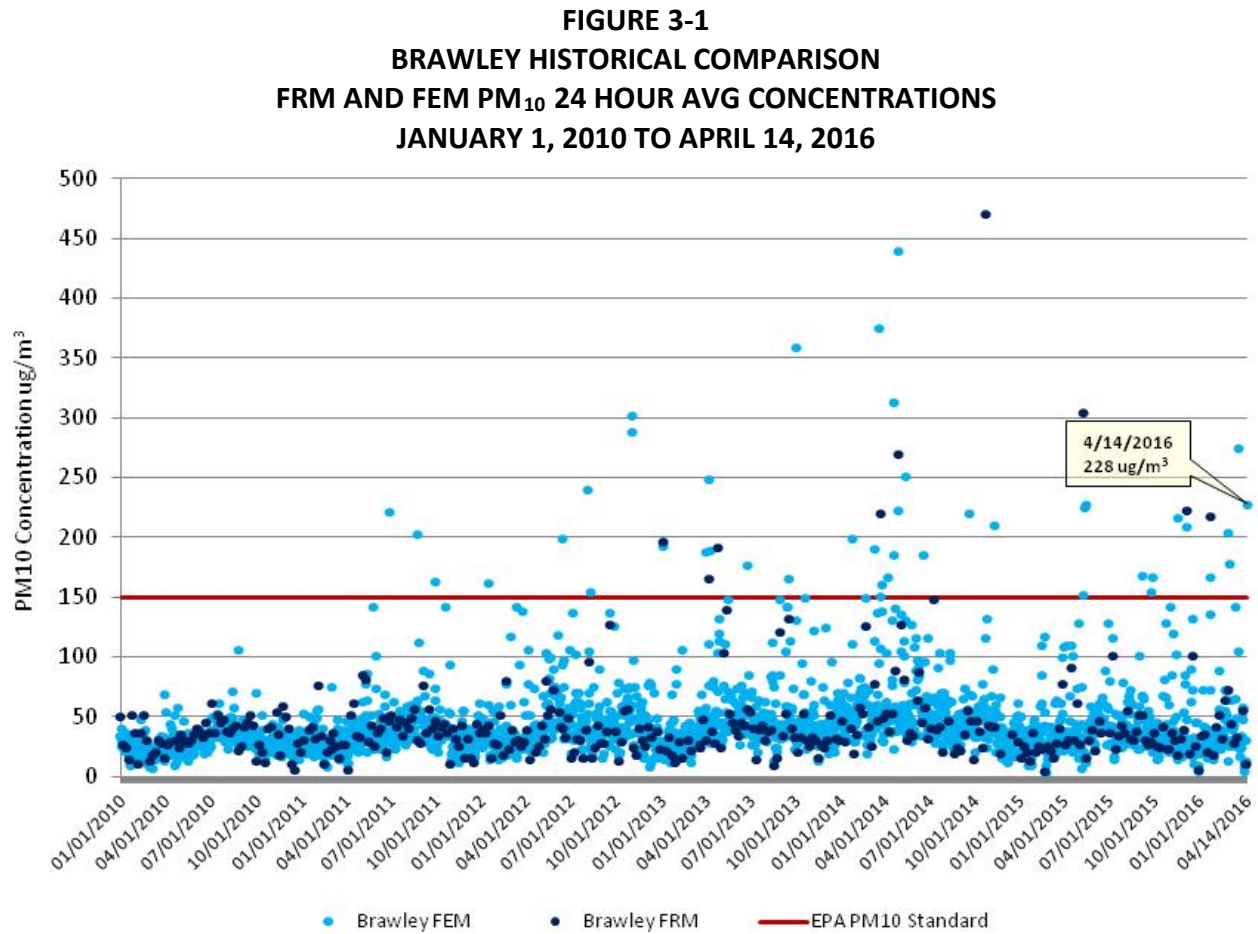


Fig 3-1: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 228 $\mu\text{g}/\text{m}^3$ by the Brawley monitor was outside the normal historical concentrations when compared to event days and non-event days

FIGURE 3-2
WESTMORLAND HISTORICAL COMPARISON
FRM AND FEM PM₁₀ 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 TO APRIL 14, 2016

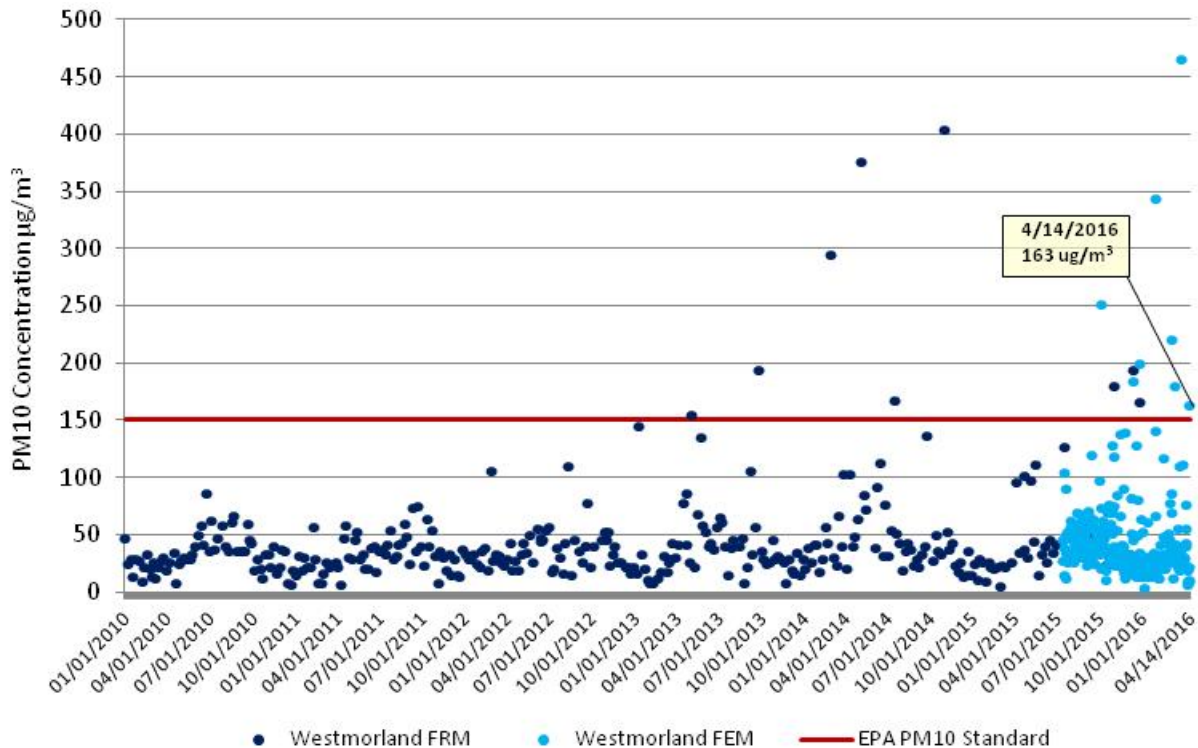
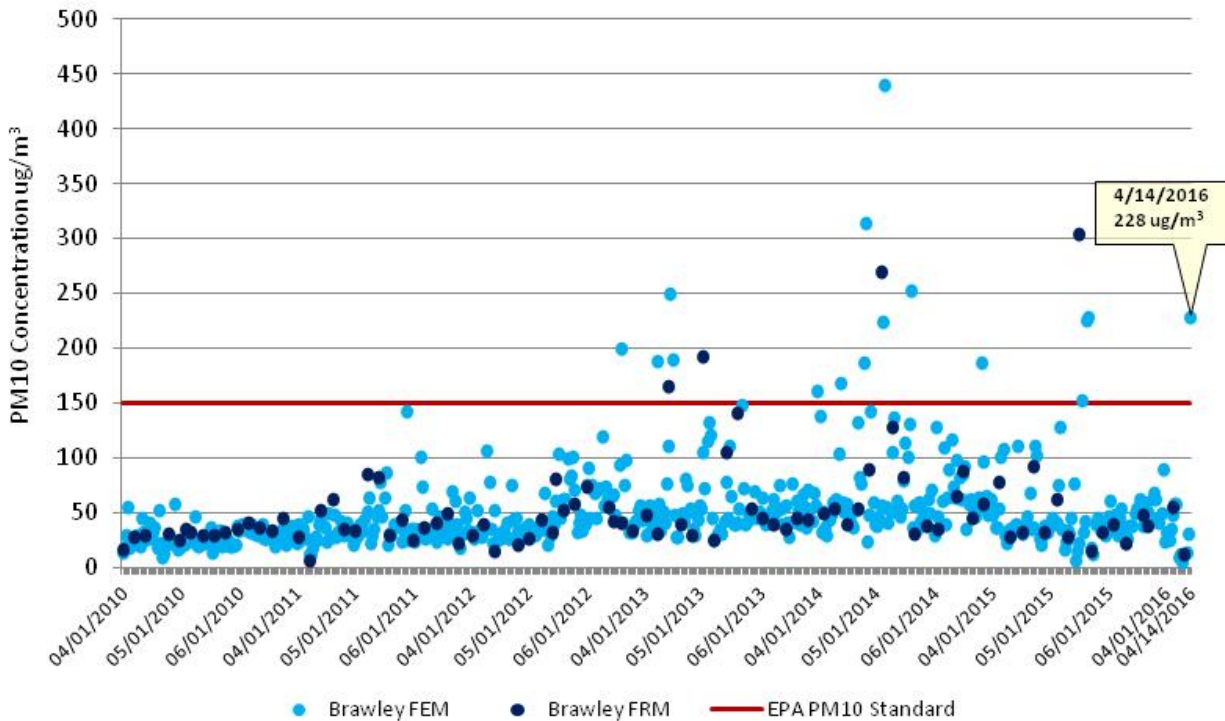


Fig 3-2: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 163 µg/m³ by the Westmorland monitor was outside the normal historical concentrations when compared to event days and non-event days

The time series, **Figures 3-1 through 3-2** for Brawley and Westmorland, included 2,296 sampling days (January 1, 2010 through April 14, 2016). During this period the Brawley station measured 2,659 credible samples, measured by either FRM or FEM monitors between January 1, 2010 and April 14, 2016.

Overall, the time series illustrates that of the 2,659 credible samples measured during there was a total of 44 exceedance days, which is a 1.7% occurrence rate. The Westmorland station measured 632 credible samples between January 1, 2010 and April 14, 2016. Only 15 exceedance days were measured during this period. This translates into just 2.4% of all samples. As mentioned above, FEM BAM data was not considered regulatory from 2010 to 2012.

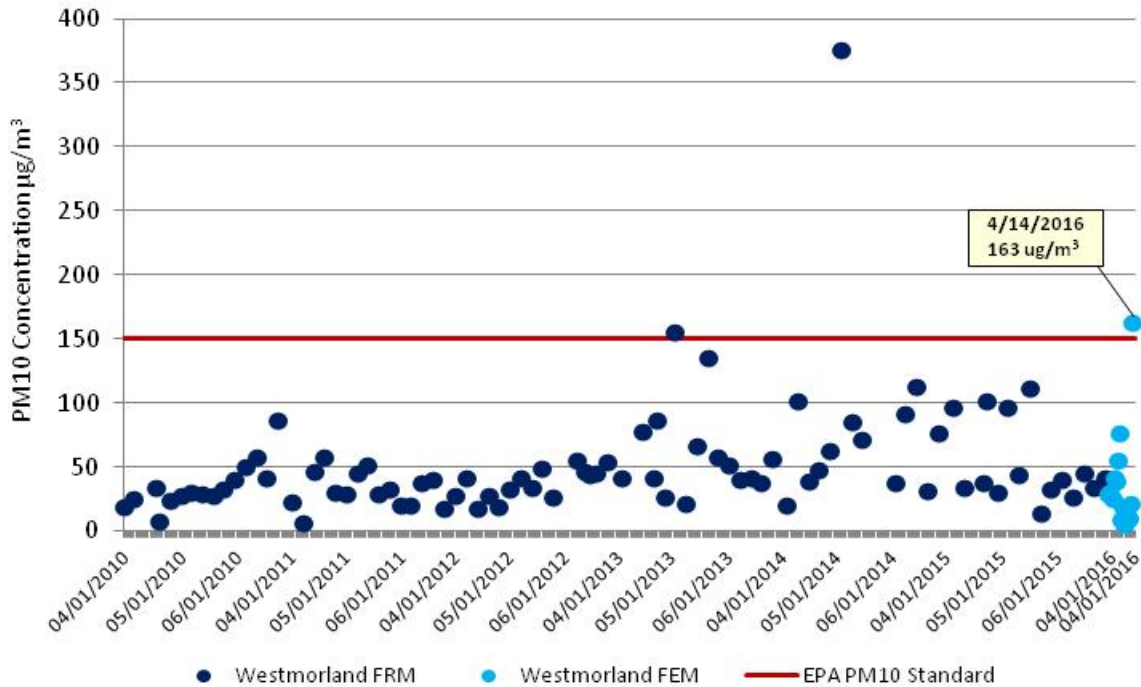
FIGURE 3-3
BRAWLEY SEASONAL COMPARISON
FRM AND FEM PM₁₀ 24 HOUR AVG CONCENTRATIONS
***APRIL 1, 2010 TO JUNE 30, 2016**



*Quarterly: April 1, 2010 to April 30, 2015 and April 1, 2016 to April 14, 2016

Fig 3-3: A comparison of PM₁₀ seasonal concentrations demonstrates that the measured concentration of 228 µg/m³ by the Brawley monitor on April 14, 2016 was outside the normal seasonal concentrations when compared to event days and non-event days

FIGURE 3-4
WESTMORLAND SEASONAL COMPARISON
FRM AND FEM PM₁₀ 24 HOUR AVG CONCENTRATIONS
***APRIL 1, 2010 THROUGH JUNE 30, 2016**



*Quarterly: April 1, 2010 to April 30, 2015 and April 1, 2016 to April 14, 2016

Fig 3-4: A comparison of PM₁₀ seasonal concentrations demonstrates that the measured concentration of 163 µg/m³ by the Westmorland monitor on April 14, 2016 was outside the normal seasonal concentrations when compared to event days and non-event days

Figures 3-3 through 3-4 display the seasonal fluctuations over 560 sampling days at the Brawley and Westmorland stations for months April through June of years 2010 through 2016 (2016 ending April 14). The seasonal sampling period for Brawley (**Figure 3-3**) contains 650 combined FRM and FEM credible samples. Of these, only 17 exceedance days occurred which translates into just 2.6% of all samples. The seasonal sampling period⁸ for Westmorland (**Figure 3-4**) contains 102 credible samples and only three exceedance days. This equates to 2.9% of all credible samples.

⁸ FEM sampling at the Westmorland site began July 2015 therefore January is the only seasonal first-quarter data available.

FIGURE 3-5
BRAWLEY HISTORICAL
FRM AND FEM PM₁₀ 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 TO APRIL 14, 2016

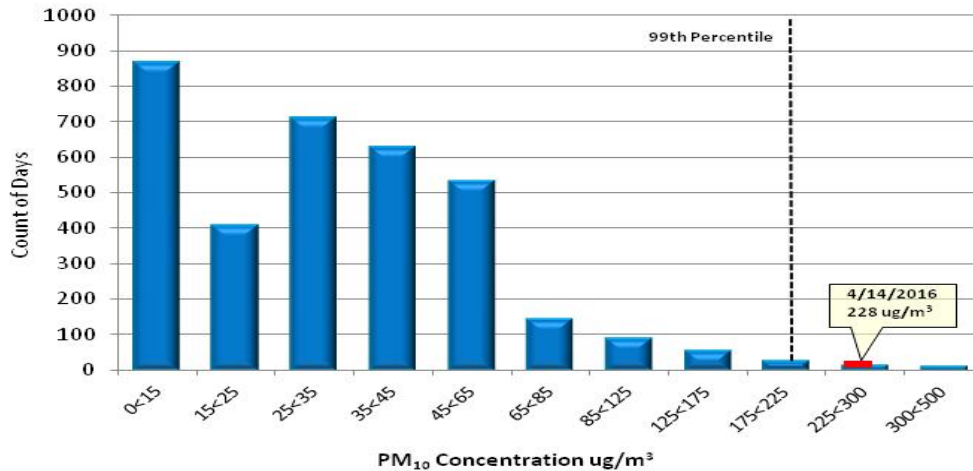


Fig 3-5: The 24-hr average PM₁₀ concentration at the Brawley monitoring site demonstrates that the concentration of 228 µg/m³ falls above the 99th percentile

FIGURE 3-6
WESTMORLAND HISTORICAL
FRM AND FEM PM₁₀ 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 TO APRIL 14, 2016

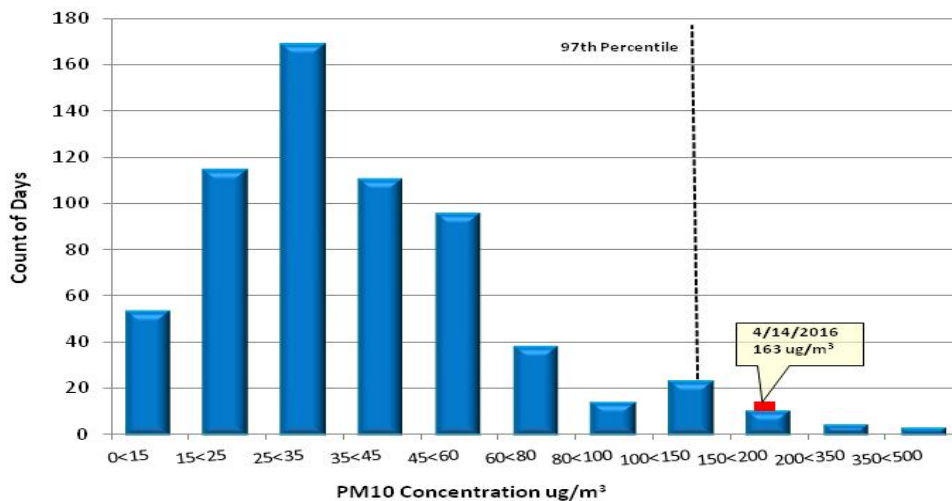


Fig 3-6: The 24-hr average PM₁₀ concentration at the Westmorland monitoring site demonstrates that the concentration of 163 µg/m³ was in excess of the 97th percentile

For the combined FRM and FEM data sets for the Brawley and Westmorland monitors the annual historical and the seasonal historical PM₁₀ concentration of 228 µg/m³ and 163 µg/m³,

respectively, are above the 99th and 97th percentile rank. Looking at the annual time series concentrations, the seasonal time series concentrations and the percentile rankings for both the historical and seasonal patterns the April 14, 2016 measured exceedance is clearly outside the normal concentration levels when comparing to non-event days and event days.

III.2 Summary

The information provided, above, by the time series plots, seasonal time series plots, and the percentile rankings illustrate that the PM₁₀ concentration observed on April 14, 2016 occurs infrequently. When comparing the measured PM₁₀ levels on April 14, 2016 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedances measured at the Brawley and Westmorland monitoring sites were outside the normal historical and seasonal historical concentration levels.

The historical concentration analysis provided here supports the determination that the April 14, 2016 natural event affected the concentrations levels at the Brawley and Westmorland monitors causing an exceedance. The concentration analysis further supports that the natural event affected air quality in such a way that there exists a clear causal relationship between the measured exceedances on April 14, 2016 and the natural event, qualifying the natural event as an Exceptional Event.

IV Not Reasonably Controllable or Preventable

According to the October 3, 2016 promulgated revision to the Exceptional Event (EE) rule under 40 CFR §50.14(b)(8) air agencies must address the “not reasonably controllable or preventable” (nRCP) criterion as two prongs. To address the nRCP criterion the ICAPCD must not only identify the natural and anthropogenic sources of emissions causing and contributing to the monitored exceedance but must identify the relevant State Implementation Plan (SIP) measures and/or other enforceable control measures in place for the identified sources. An effective analysis of the nRCP must include the implementation status of the control measures to consider the measures as enforceable. USEPA considers control measures enforceable if approved into the SIP within 5 years of an EE demonstration submittal. The identified control measures must address those specific sources that as causing or contributing to a monitored exceedance.

The final EE rule revision explains that an event is not reasonably controllable if reasonable measures to control the impact of the event on air quality were applied at the time of the event. Similarly, an event is not reasonably preventable if reasonable measures to prevent the event were applied at the time of the event. However, for “high wind events” when PM₁₀ concentrations are due to dust raised by high winds from desert areas whose sources are controlled with Best Available Control Measures (BACM) then the event is a “natural event” where human activity plays little or no direct causal role and thus is considered not preventable.

This section begins by providing background information on all SIP and other enforceable control measures in force during the EE for April 14, 2016. In addition, this April 14, 2016 demonstration provides technical and non-technical evidence that strong and gusty westerly winds blew across the mountains and deserts within southeastern California and into Imperial County suspending particulate matter affecting the Brawley and Westmorland monitors on April 14, 2016. This section identifies all natural and anthropogenic sources and provides regulatory evidence of the enforceability of the control measures in place during the April 14, 2016 EE.

IV.1 Background

Inhalable particulate matter (PM₁₀) contributes to effects that are harmful to human health and the environment, including premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function, visibility impairment, and damage to vegetation and ecosystems. Upon enactment of the 1990 Clean Air Act (CAA) amendments, Imperial County was classified as moderate nonattainment for the PM₁₀ NAAQS under CAA sections 107(d)(4)(B) and 188(a). By November 15, 1991, such areas were required to develop and submit State Implementation Plan (SIP) revisions providing for, among other things, implementation of reasonably available control measures (RACM).

Partly to address the RACM requirement, ICAPCD adopted local Regulation VIII rules to control PM₁₀ from sources of fugitive dust on October 10, 1994, and revised them on November 25, 1996. USEPA did not act on these versions of the rules with respect to the federally enforceable SIP.

On August 11, 2004, USEPA reclassified Imperial County as a serious nonattainment area for PM₁₀. As a result, CAA section 189(b)(1)(B) required all BACM to be implemented in the area within four years of the effective date of the reclassification, i.e., by September 10, 2008.

On November 8, 2005, partly to address the BACM requirement, ICAPCD revised the Regulation VIII rules to strengthen fugitive dust requirements. On July 8, 2010, USEPA finalized a limited approval of the 2005 version of Regulation VIII, finding that the seven Regulation VIII rules largely fulfilled the relevant CAA requirements. Simultaneously, USEPA also finalized a limited disapproval of several of the rules, identifying specific deficiencies that needed to be addressed to fully demonstrate compliance with CAA requirements regarding BACM and enforceability.

In September 2010, ICAPCD and the California Department of Parks and Recreation (DPR) filed petitions with the Ninth Circuit Federal Court of Appeals for review of USEPA's limited disapproval of the rules. After hearing oral argument on February 15, 2012, the Ninth Circuit directed the parties to consider mediation before rendering a decision on the litigation. On July 27, 2012, ICAPCD, DPR and USEPA reached agreement on a resolution to the dispute which included a set of specific revisions to Regulation VIII. These revisions are reflected in the version of Regulation VIII adopted by ICAPCD on October 16, 2012 and approved by USEPA April 22, 2013. Since 2006 ICAPCD had implemented regulatory measures to control emissions from fugitive dust sources and open burning in Imperial County.

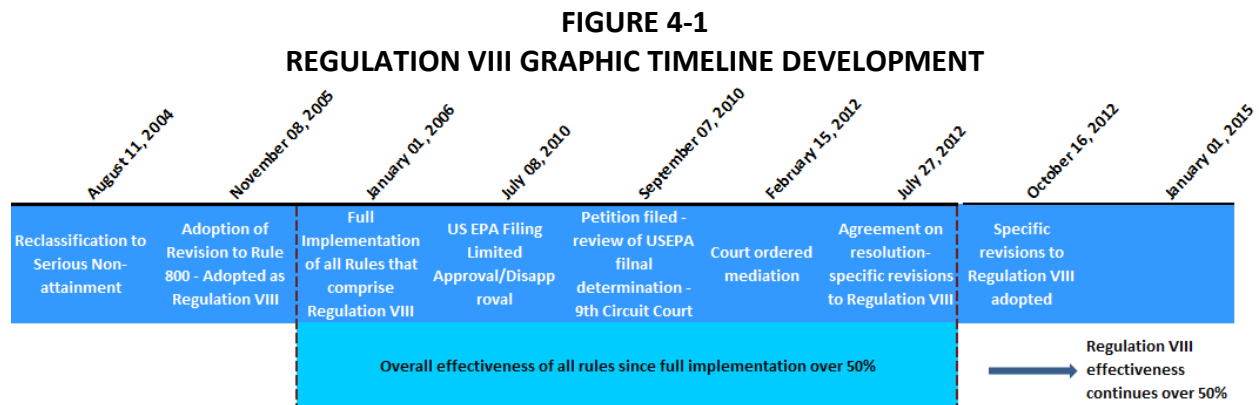


Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

A brief summary of Regulation VIII which is comprised of seven fugitive dust rules is found below. The complete set of rules can be found in **Appendix D**.

ICAPCD's Regulation VIII consists of seven interrelated rules designed to limit emissions of PM₁₀ from anthropogenic fugitive dust sources in Imperial County.

Rule 800, General Requirements for Control of Fine Particulate Matter, provides definitions, a compliance schedule, exemptions and other requirements generally applicable to all seven rules. It requires the United States Bureau of Land Management (BLM), United States Border Patrol (BP) and DPR to submit dust control plans (DCP) to mitigate fugitive dust from areas and/or activities under their control. Appendices A and B within Rule 800 describe methods for determining compliance with opacity and surface stabilization requirements in Rules 801 through 806.

Rule 801, Construction and Earthmoving Activities, establishes a 20% opacity limit and control requirements for construction and earthmoving activities. Affected sources must submit a DCP and comply with other portions of Regulation VIII regarding bulk materials, carry-out and track-out, and paved and unpaved roads. The rule exempts single family homes and waives the 20% opacity limit in winds over 25 mph under certain conditions.

Rule 802, Bulk Materials, establishes a 20% opacity limit and other requirements to control dust from bulk material handling, storage, transport and hauling.

Rule 803, Carry-Out and Track-Out, establishes requirements to prevent and clean-up mud and dirt transported onto paved roads from unpaved roads and areas.

Rule 804, Open Areas, establishes a 20% opacity limit and requires land owners to prevent vehicular trespass and stabilize disturbed soil on open areas larger than 0.5 acres in urban areas, and larger than three acres in rural areas. Agricultural operations are exempted.

Rule 805, Paved and Unpaved Roads, establishes a 20% opacity limit and control requirements for unpaved haul and access roads, canal roads and traffic areas that meet certain size or traffic thresholds. It also prohibits construction of new unpaved roads in certain circumstances. Single-family residences and agricultural operations are exempted.

Rule 806, Conservation Management Practices, requires agricultural operation sites greater than 40 acres to implement at least one conservation management practice (CMP) for each of several activities that often generates dust at agricultural operations. In addition, agricultural operation sites must prepare a CMP plan describing how they comply with Rule 806, and must make the CMP plan available to the ICAPCD upon request.

IV.1.b Additional Measures

Imperial County Natural Events Action Plan (NEAP)

On August 2005, the ICAPCD adopted a NEAP for the Imperial County, as was required under the former USEPA Natural Events Policy, to address PM₁₀ events by:

- Protecting public health;
- Educating the public about high wind events;

- Mitigating health impacts on the community during future events; and
- Identifying and implementing BACM measures for anthropogenic sources of windblown dust.

Smoke Management Plan (SMP) Summary

There are 35 Air Pollution Control Districts or Air Quality Management Districts in California which are required to implement a district-wide smoke management program. The regulatory basis for California's Smoke Management Program, codified under Title 17 of the California Code of Regulations is the "Smoke Management Guidelines for Agricultural and Prescribed Burning" (Guidelines). California's 1987 Guidelines were revised to improve interagency coordination, avoid smoke episodes, and provide continued public safety while providing adequate opportunity for necessary open burning. The revisions to the 1987 Guidelines were approved March 14, 2001. All air districts, with the exception of the San Joaquin Valley Air Pollution Control District (SJAPCD) were required to update their existing rules and Smoke Management Plans to conform to the most recent update to the Guidelines.

Section 80150 of Title 17 specifies the special requirements for open burning in agricultural operations, the growing of crops and the raising of fowl or animals. This section specifically requires the ICAPCD to have rules and regulations that require permits that contain requirements that minimize smoke impacts from agricultural burning.

On a daily basis, the ICAPCD reviews surface meteorological reports from various airport agencies, the NWS, State fire agencies and CARB to help determine whether the day is a burn day. Using a four quadrant map of Imperial County allowed burns are allocated in such a manner as to assure minimal to no smoke impacts safeguarding the public health. Finally, all permit holders are required to notice and advise members of the public of a potential burn. This noticing requirement is known as the Good Neighbor Policy. On April 14, 2016 the ICAPCD declared a No Burn day (**Appendix A**). No complaints were filed for agricultural burning on April 14, 2016.

IV.1.c Review of Source Permitted Inspections and Public Complaints

A query of the ICAPCD permit database was compiled and reviewed for active permitted sources throughout Imperial County and specifically around Westmorland and Brawley during the April 14, 2016 PM₁₀ exceedance. Both permitted and non-permitted sources are required to comply with Regulation VIII requirements that address fugitive dust emissions. The identified permitted sources are Aggregate Products, Inc., US Gypsum Quarry, Imperial Aggregates (Val-Rock, Inc., and Granite Construction), US Gypsum Plaster City, Clean Harbors (Laidlaw Environmental Services), Bullfrog Farms (Dairy), Burrtec Waste Industries, Border Patrol Inspection station, Centinela State Prison, various communications towers not listed and various agricultural operations. Non-permitted sources include the wind farm known as Ocotillo Express, and a solar facility known as CSolar IV West. Finally, the desert regions are under the jurisdiction of the Bureau of Land Management and the California Department of Parks (Including Anza Borrego State Park and Ocotillo Wells).

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM₁₀ emissions. There were no filed agricultural or waste burning or dust complaints on April 14, 2016 officially declared as a No Burn day.

FIGURE 4-2
PERMITTED SOURCES

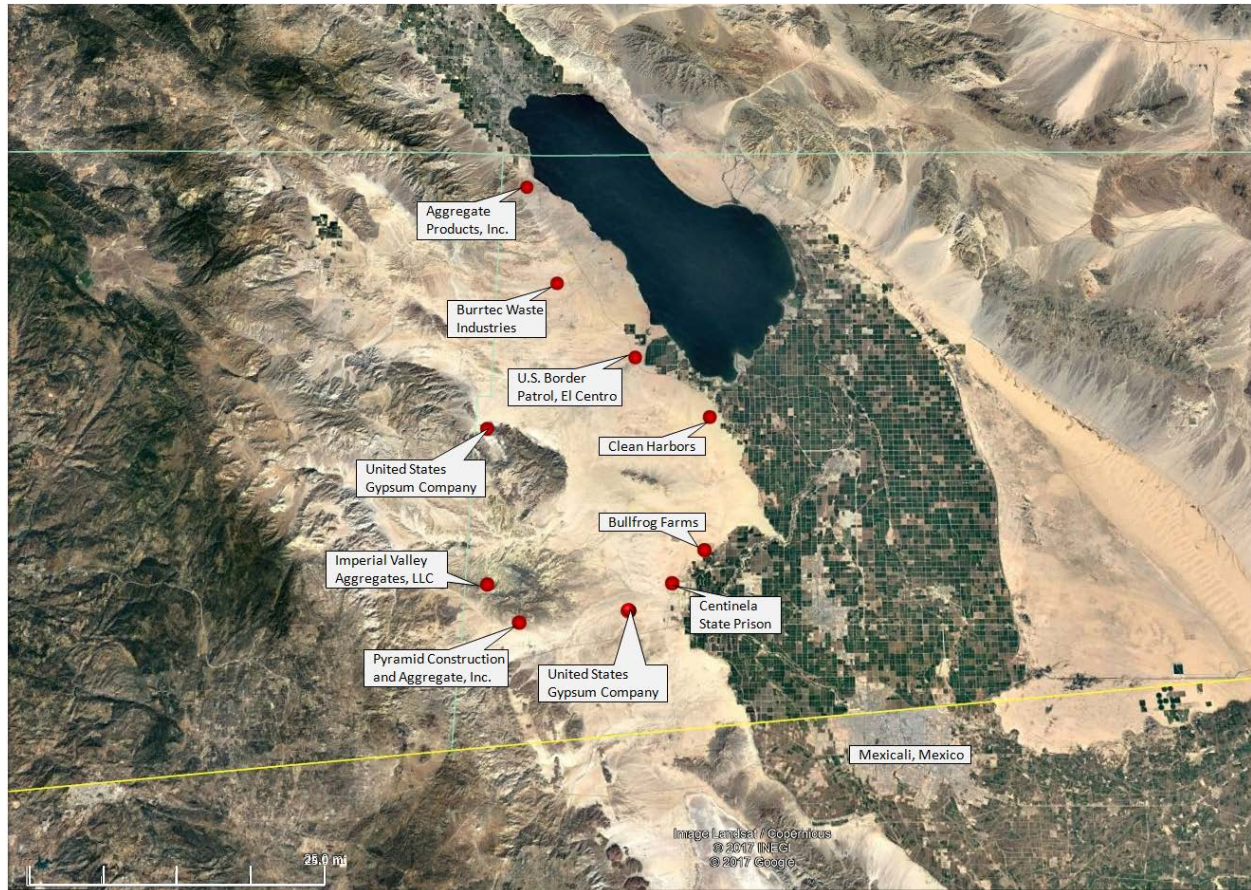


Fig 4-2: The above map identifies those permitted sources located west, northwest and southwest of the Westmorland and Brawley monitors. The green line to the north denotes the political division between Imperial and Riverside counties. The yellow line below denotes the international border between the United States and Mexico. The green checker-boarded areas are a mixed use of agricultural and community parcels. In addition, the desert areas are managed either by the Bureau of Land Management or the California Department of Parks. Base map from Google Earth

FIGURE 4-3
NON-PERMITTED SOURCES

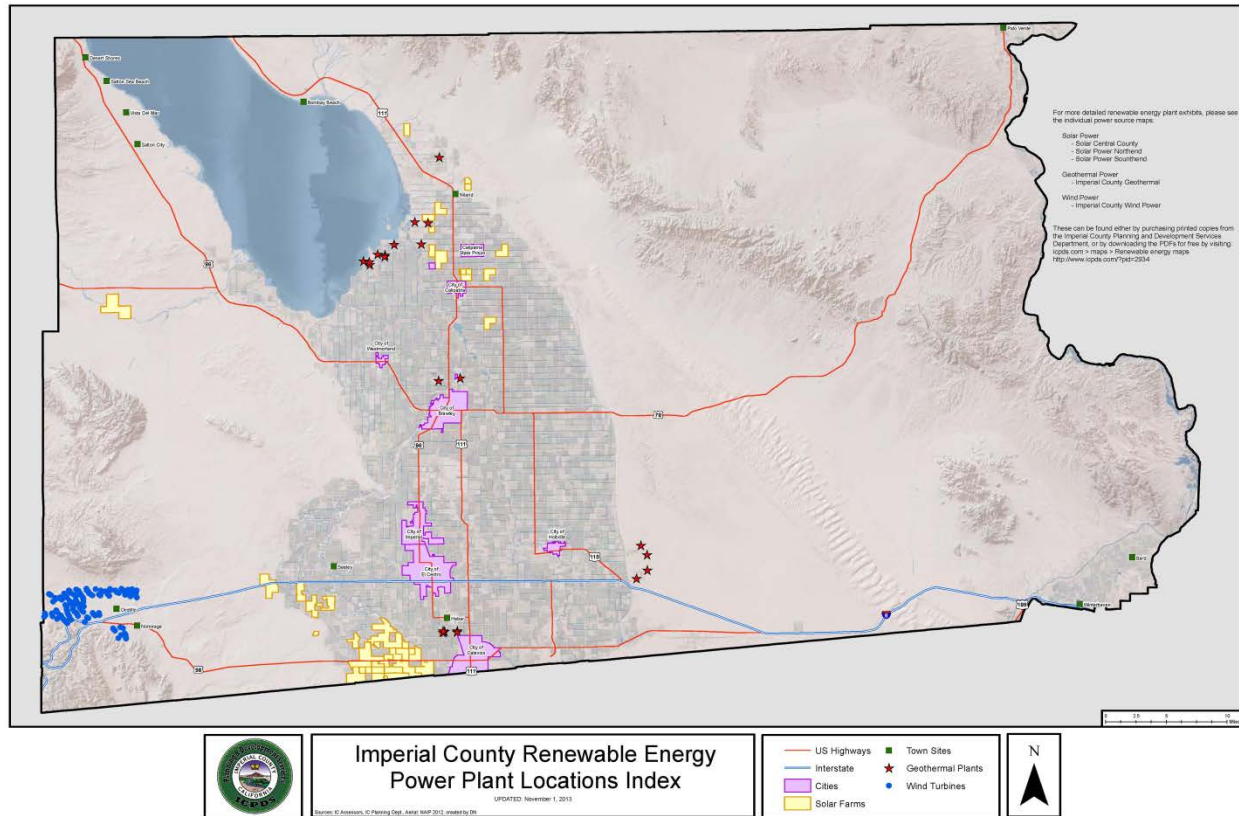


Fig 4-3: The above map identifies those power sources located west, northwest and southwest of the Brawley and Westmorland monitors. Blue indicate the Wind Turbines, Yellow are the solar farms and stars are geothermal plants

IV.2 Forecasts and Warnings

At 5:22 p.m. on April 13, 2016 the NWS Phoenix office issued a wind advisory (effective through April 14) for Imperial County. It included portions of southeastern California north of Imperial County southward from Blythe along the lower Colorado River Valley to Yuma, Arizona. Northwest winds of 25 to 35 mph with gusts reaching 45 mph were forecasted. A wind advisory also extended eastward as far as Tacna and Wellton, Arizona. The NWS San Diego office issued a High Wind Warning at 2:16 p.m. on April 14, 2016 for a broad area that included the mountains and deserts of San Diego County. West to northwest winds of up to 35 mph with gusts to 60 mph were forecasted for mountain ridges and the desert slopes. Visibility was expected to be reduced to less than three miles or less due to blowing dust and sand (**Appendix A**).

On April 13, 2016 the ICAPCD posted on its website a combined weather story and forecast from the NWS San Diego office regarding the high winds that were expected April 14, 2016 through April 15, 2016. On April 14, 2016 the ICAPCD posted a combined weather story and forecast from the NWS Phoenix office forecasting winds of up to 50 mph in southeastern California along with

the possibility of blowing dust (**Appendix A**). The notice also carried an advisory that high winds had the potential to suspend particulate matter into the air, and possibly pose an impact to public health.

IV.3 Wind Observations

Wind data during the event were collected from airports in eastern Riverside County, southeastern San Diego County, southwestern Yuma County (Arizona), northern Mexico, and Imperial County. Data were also collected from automated meteorological instruments that were upstream from the Brawley and Westmorland station monitors during the wind event. El Centro NAF (KNJK) had seven hours of winds at or above 25 mph. Imperial County Airport (KIPL) had three hours of winds above 25 mph. Wind speeds of 25 mph are normally sufficient to overcome most PM₁₀ control measures. During the April 14, 2016 event wind speeds were above the 25 mph threshold, overcoming the BACM in place.

IV.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that high winds accompanying a strong but dry low-pressure system and cold front that moved through southern California suspended dust that caused uncontrollable PM₁₀ emissions. The BACM list as part of the control measures in Imperial County for fugitive dust emissions were in place at the time of the event. These control measures are required for areas designated as "serious" non-attainment for PM₁₀, such as Imperial County. Thus, the BACM in place at the time of the event were beyond reasonable. In addition, surface wind measurements at or upstream of Brawley and Westmorland monitoring stations during the event were high enough (at or above 25 mph, with wind gusts of 36 mph) that BACM PM₁₀ control measures would have been overwhelmed.

Finally, a high wind dust event can be considered as a natural event, even when portions of the wind-driven emissions are anthropogenic, as long as those emissions have a clear causal relationship to the event and were determined to be not reasonably controllable or preventable. This demonstration has shown that the event that occurred on April 14, 2016 was not reasonably controllable or preventable despite the strong and in force BACM within the affected areas in Imperial County. This demonstration has similarly established a clear causal relationship between the exceedances and the high wind event timeline and geographic location. The April 14, 2016 event can be considered an exceptional event under the requirements of the exceptional event rule.

V Clear Causal Relationship

V.1 Discussion

Meteorological observations for April 14, 2016 identified strong gusty westerly winds caused when an upper level low moving over the region caused surface gradients to tighten, creating a strong onshore flow across the mountains and deserts of southeastern California and into portions of western Arizona. Strong westerly winds up to 30 mph with gusts reaching 36 mph entrained windblown dust from natural areas, particularly from the desert areas west of Westmorland and Brawley, along with anthropogenic sources controlled with BACM, into Imperial County. **Figures 5-1 and 5-2** show the tightening of the surface gradient and the resulting winds that entrained particulate matter (**Figures 5-3 and 5-4**).

FIGURE 5-1
SURFACE PRESSURE GRADIENT TIGHTENS

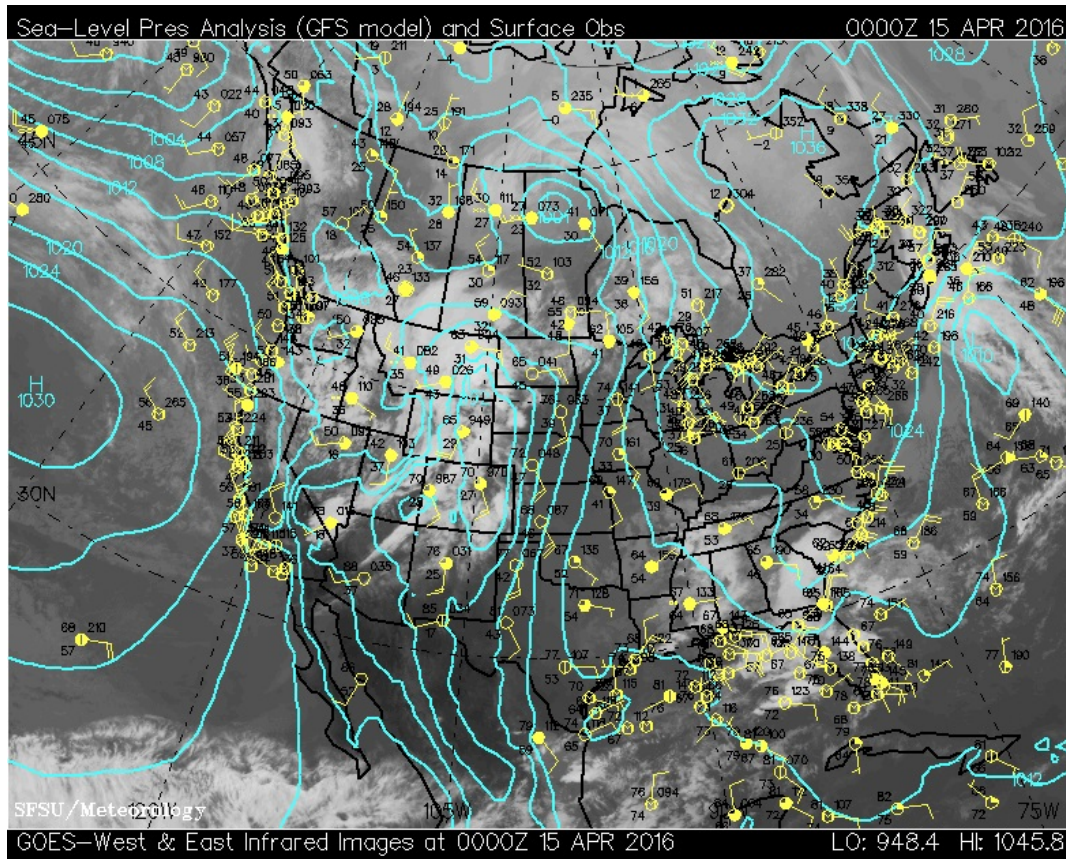


Fig 5-1: A GOES-W infrared sea level pressure analysis image shows the strengthening of the pressure gradient at 1600 PST on April 14, 2016. The was around the period that both Imperial County Airport and El Centro NAF were reporting some of their highest winds, and at the hour that Westmorland and Brawley reported a significant jump in PM₁₀ concentrations. Source: SFSU Department of Earth & Climate Sciences and the California Regional weather Server; http://squall.sfsu.edu/crws/archive/sathts_arch.html

FIGURE 5-2
HIGH ACROSS SOUTHEASTERN CALIFORNIA RAISE DUST/SAND

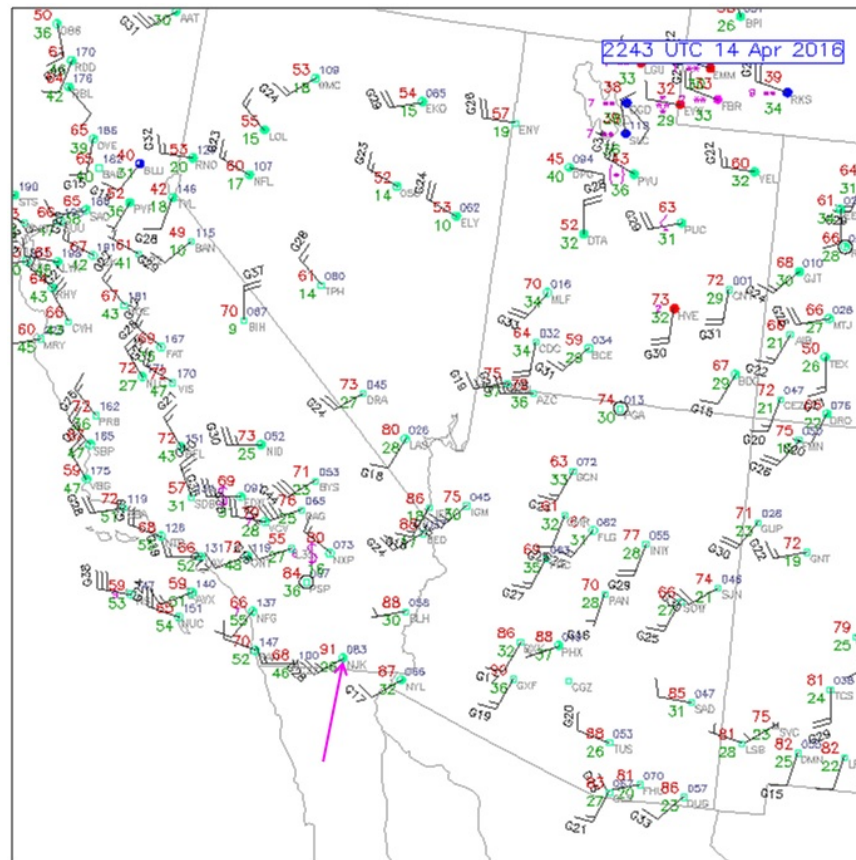


Fig 5-2: Is a surface wind map depicting high winds across southeast California at 1443 PST. Winds at KNJK (see arrow) were at least 28.3 mph. Source: <http://weather.rap.ucar.edu/satellite>

Figure 5-3 shows the Aerosol Optical Depth over southeastern California as captured by the MODIS instrument onboard the Terra satellite using the Deep Blue Aerosol Angstrom Exponent.⁹

⁹ **Aerosol Optical Depth (AOD)** (or Aerosol Optical Thickness) indicates the level at which particles in the air (aerosols) prevent light from traveling through the atmosphere. Aerosols scatter and absorb incoming sunlight, which reduces visibility. From an observer on the ground, an AOD of less than 0.1 is “clean” - characteristic of clear blue sky, bright sun and maximum visibility. As AOD increases to 0.5, 1.0, and greater than 3.0, aerosols become so dense that sun is obscured. Sources of aerosols include pollution from factories, smoke from fires, dust from dust storms, sea salt, and volcanic ash and smog. Aerosols compromise human health when inhaled by people, particularly those with asthma or other respiratory illnesses. The MODIS **Deep Blue Aerosol Ångström Exponent** layer can be used to provide additional information related to the aerosol particle size over land. This layer is created from the Deep Blue (DB) algorithm, originally developed for retrieving over desert/arid land (bright in the visible wavelengths). The Ångström exponent provides additional information on the particle size (larger the exponent, the smaller the particle size). Values < 1 suggest optical dominance of coarse particles (e.g. dust) and values > 1 suggest optical dominance of fine particles (e.g. smoke) <https://worldview.earthdata.nasa.gov>. The Ångström Exponent (denoted as AE or α) is a measure of how the AOD changes relative to the various wavelength of light (known as ‘spectral dependence’). This is related to the aerosol particle size. Roughly speaking, values less than 1 suggest an optical dominance of coarse particles (e.g. dust, ash, sea spray), while values greater than one 1 dominance of fine particles (e.g. smoke, industrial pollution); Source: <https://worldview.earthdata.nasa.gov> and <https://deepblue.gsfc.nasa.gov/science>

Green colors represent the dominance of larger particles (likely dust) while blue indicates finer particles. **Figure 5-4** shows AOD as captured by the MODIS instrument onboard the Aqua satellite. Additionally, NOAA's Smoke Text Product (effective through 1930 PST) identified blowing dust over southern California and a "possible patch of blowing dust" near the Salton Sea near sunset, but that further observations were hindered by clouds (**Appendix A**).

FIGURE 5-3
AEROSOL OPTICAL DEPTH TERRA SATELLITE

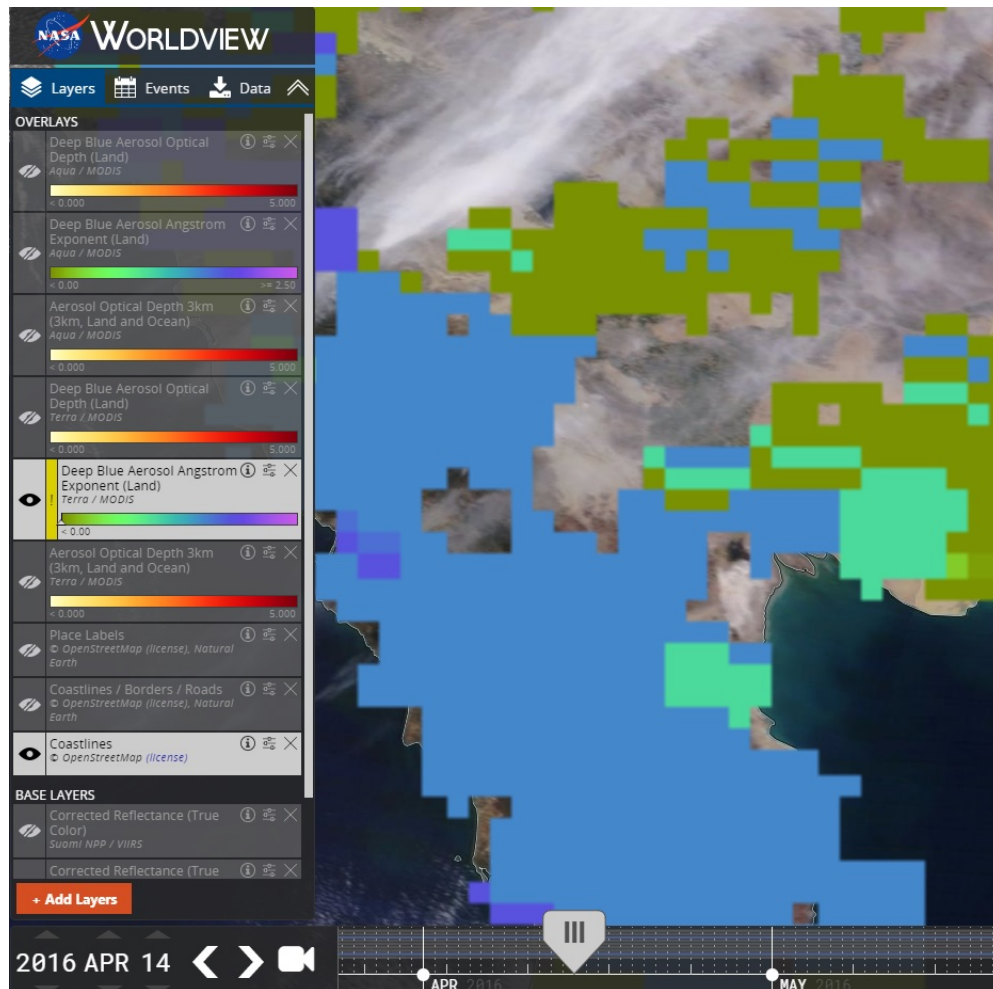


Fig 5-3: Aerosol optical depth as captured by the MODES instrument onboard the Terra satellite using the Deep Blue Angstrom exponent around ~1030 PST. Source: <https://worldview.earthdata.nasa.gov>

FIGURE 5-4
AEROSOL OPTICAL DEPTH AQUA SATELLITE

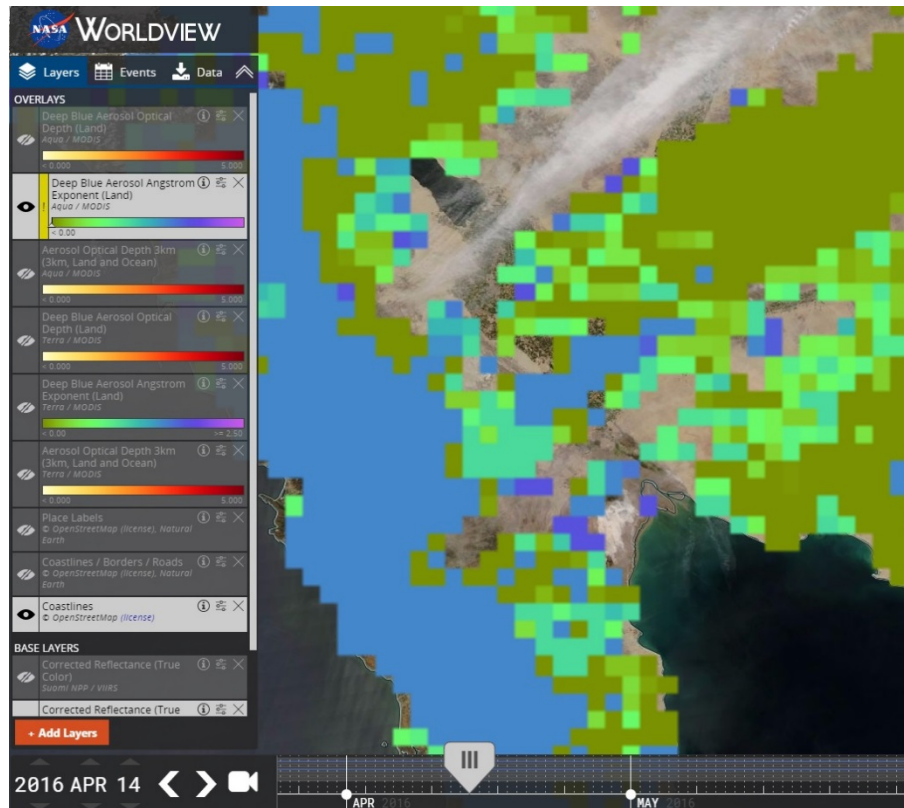


Fig 5-4: Aerosol optical depth as captured by the MODIS instrument onboard the Aqua satellite using the Deep Blue AOD around ~1330 PST. Source: <https://worldview.earthdata.nasa.gov>

The wind event of April 14, 2016 was regional. **Figure 5-5** is an image from the NWS Weather & Hazards Viewer on April 14, 2016 that depicts a wind advisory over a wide area of southeastern California along with wind barbs indicating wind speeds and direction. A Wind Advisory was issued for Imperial County and neighboring areas due to the expected intensity of the storm. At 5:22 p.m. on April 13, 2016 the NWS Phoenix office issued a wind advisory (effective through April 14, 2016) for Imperial County. It included portions of southeastern California north of Imperial County southward from Blythe along the lower Colorado River Valley to Yuma, Arizona. Northwest winds of 25 to 35 mph with gusts reaching 45 mph were forecasted. A wind advisory also extended eastward as far as Tacna and Wellton, Arizona. The NWS San Diego office issued a High Wind Warning at 2:16 p.m. on April 14, 2016 for a broad area that included the mountains and deserts of San Diego County. West to northwest winds of up to 35 mph with gusts to 60 mph were forecasted for mountain ridges and the desert slopes. Visibility was expected to be reduced to less than three miles or less due to blowing dust and sand (**Appendix A**).

FIGURE 5-5
WIND ADVISORY MAP AND WIND SPEEDS – APRIL 14, 2016

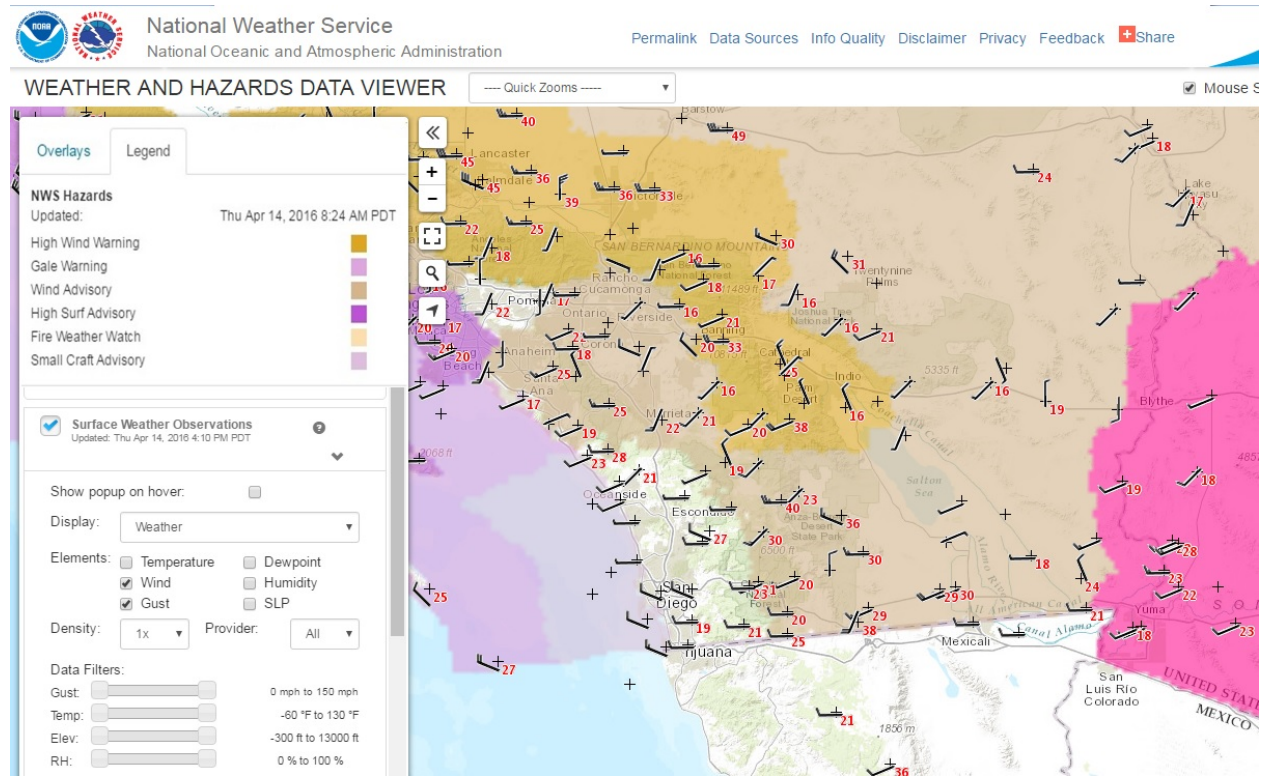


Fig 5-5: The April 14, 2016 wind event impacted a regional area. The left image depicts wind speeds and areas covered by a high wind warning (light brown) at 1610 PST on April 14, 2016. Source: NWS Weather & Hazards Viewer

The EPA accepts a high wind threshold for sustained winds of 25 mph in California and 12 other states.¹⁰ **Tables 5-1 through 5-2** provide a temporal relationship of wind speeds, wind direction, wind gusts (if available), and PM₁₀ concentrations at the exceeding stations. The Brawley and Westmorland monitors show peak hourly concentrations following or during the period of high upstream wind speeds. The Brawley station does not have its own meteorological instruments, as does Westmorland.

¹⁰ "Treatment of Data Influenced by Exceptional Events; Final Guidance", FR Vol. 81, No. 191, 68279, October 3, 2016

TABLE 5-1
WIND SPEEDS AND PM₁₀ CONCENTRATIONS FOR BRAWLEY APRIL 14, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				SUNRISE-OCOTILLO (IMPSD)				FISH CREEK MTNS. (FHCC1)				BRAWLEY FEM	
HOURL	W/S	W/D	W/G	HOURL	W/S	W/D	W/G	HOURL	W/S	W/D	W/G	HOURL	W/S	W/D	W/G	HOURL	PM ₁₀ (µg/m ³)
56	13	260		53	5	290		0000	10	248	17	0:26	18	208	26	0000	74
156	10	290		153	6	280		0100	11	250	20	1:26	11	199	25	0100	33
256	16	250		253	13	260		0200	10	234	16	2:26	10	208	21	0200	45
356	17	280		353	10	280		0300	12	269	23	3:26	14	202	19	0300	9
456	17	260		453	14	280		0400	10	259	19	4:26	12	206	20	0400	17
556	10	240		553	11	270		0500	10	262	18	5:26	11	209	17	0500	12
656	7	310		653	10	280		0600	9	265	16	6:26	6	225	14	0600	22
756	8	310		753	7	300		0700	13	249	23	7:26	3	345	12	0700	24
856	9	320		853	9	300		0800	11	243	19	8:26	6	49	9	0800	23
956	7	VR		953	7	320		0900	16	233	24	9:26	4	115	11	0900	27
1056	0	0		1053	0	0		1000	14	245	22	10:26	5	9	12	1000	24
1156	3	70		1153	5	350		1100	11	250	21	11:26	13	281	23	1100	18
1256	14	270	23	1253	6	310		1200	18	241	26	12:26	16	278	26	1200	25
1356	26	240	32	1353	23	250	28	1300	16	259	23	13:26	19	302	30	1300	30
1456	24	240	29	1453	18	240	30	1400	18	252	30	14:26	16	280	30	1400	67
1556	26	240	36	1553	29	250	36	1500	17	254	29	15:26	14	301	29	1500	
1656	29	240	33	1653	25	260	33	1600	15	262	26	16:26	13	246	40	1600	162
1756	30	250		1753	25	250	32	1700	16	256	32	17:26	23	255	40	1700	995
1856	29	260		1853	22	250	32	1800	18	249	29	18:26	15	252	36	1800	995
1956	26	260	34	1953	20	260		1900	21	250	33	19:26	15	270	33	1900	995
2056	24	260		2053	22	270	32	2000	22	252	38	20:26	7	251	26	2000	503
2156	28	260		2153	22	260	32	2100	24	250	37	21:26	8	276	17	2100	725
2256	22	260	31	2253	17	270	25	2200	25	245	39	22:26	13	221	30	2200	309
2356	23	250		2353	16	270		2300	23	241	33	23:26	10	268	26	2300	111

*Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for Sunrise Ocotillo (IMPSD) and Fish Creek Mountains (FHCC1) from the University of Utah's MesoWest system. Brawley station does not record wind data. Wind speeds = mph; Direction = degrees

TABLE 5-2
WIND SPEEDS AND PM₁₀ CONCENTRATIONS FOR WESTMORLAND APRIL 14, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				SUNRISE-OCOTILLO (IMPSD)				WESTMORLAND				WESTMORLAND FEM	
HOURL	W/S	W/D	W/G	HOURL	W/S	W/D	W/G	HOURL	W/S	W/D	W/G	HOURL	W/S	W/D	W/G	HOURL	PM ₁₀ (µg/m ³)
56	13	260		53	5	290		0000	10	248	17	0000	9.4	281		0000	12
156	10	290		153	6	280		0100	11	250	20	0100	5.6	288		0100	24
256	16	250		253	13	260		0200	10	234	16	0200	2.7	236		0200	21
356	17	280		353	10	280		0300	12	269	23	0300	4.5	267		0300	14
456	17	260		453	14	280		0400	10	259	19	0400	3.5	219		0400	19
556	10	240		553	11	270		0500	10	262	18	0500	3.2	243		0500	28
656	7	310		653	10	280		0600	9	265	16	0600	1.7	250		0600	59
756	8	310		753	7	300		0700	13	249	23	0700	3.9	326		0700	28
856	9	320		853	9	300		0800	11	243	19	0800	9	321		0800	40
956	7	VR		953	7	320		0900	16	233	24	0900	9.6	318		0900	28
1056	0	0		1053	0	0		1000	14	245	22	1000	7.2	345		1000	28
1156	3	70		1153	5	350		1100	11	250	21	1100	4.5	358		1100	
1256	14	270	23	1253	6	310		1200	18	241	26	1200	4.3	80		1200	22
1356	26	240	32	1353	23	250	28	1300	16	259	23	1300	3.9	73		1300	28
1456	24	240	29	1453	18	240	30	1400	18	252	30	1400	3.2	323		1400	41
1556	26	240	36	1553	29	250	36	1500	17	254	29	1500	7.4	282		1500	40
1656	29	240	33	1653	25	260	33	1600	15	262	26	1600	13.7	288		1600	275
1756	30	250		1753	25	250	32	1700	16	256	32	1700	17.8	277		1700	981
1856	29	260		1853	22	250	32	1800	18	249	29	1800	16.3	275		1800	782
1956	26	260	34	1953	20	260		1900	21	250	33	1900	16.8	275		1900	533
2056	24	260		2053	22	270	32	2000	22	252	38	2000	16.8	279		2000	481
2156	28	260		2153	22	260	32	2100	24	250	37	2100	15.7	283		2100	129
2256	22	260	31	2253	17	270	25	2200	25	245	39	2200	13.5	293		2200	74
2356	23	250		2353	16	270		2300	23	241	33	2300	12.6	286		2300	74

*Wind data for KIPL and KNJK from the NCEI's QCLCD system. Westmorland does not record gusts. Wind data for Sunrise Ocotillo (IMPSD) from the University of Utah's MesoWest system. Wind and air quality data for Westmorland from the EPA's AQS data bank. Wind speeds = mph; Direction = degrees

Figure 5-6 depicts a six-hour back-trajectory ending at 1700 PST which is the hour that both Westmorland and Brawley FEM monitors were recording peak hourly values on April 14, 2016. Starting around mid-day winds became solidly westerly and increased, accompanied by strong gusts that reached 36 mph at both KIPL and KNJK. Strong winds and gusts recorded at upstream stations at Ocotillo Wells, the Fish Creek Mountains, and Sunrise-Ocotillo also either had winds at or above the 25 mph wind threshold or gusts of 30 mph or more. Concentrations of PM₁₀ at Brawley and Westmorland rose during the afternoon in response to the arrival of dust laden winds.

FIGURE 5-6
EXCEEDANCE TIMELINE

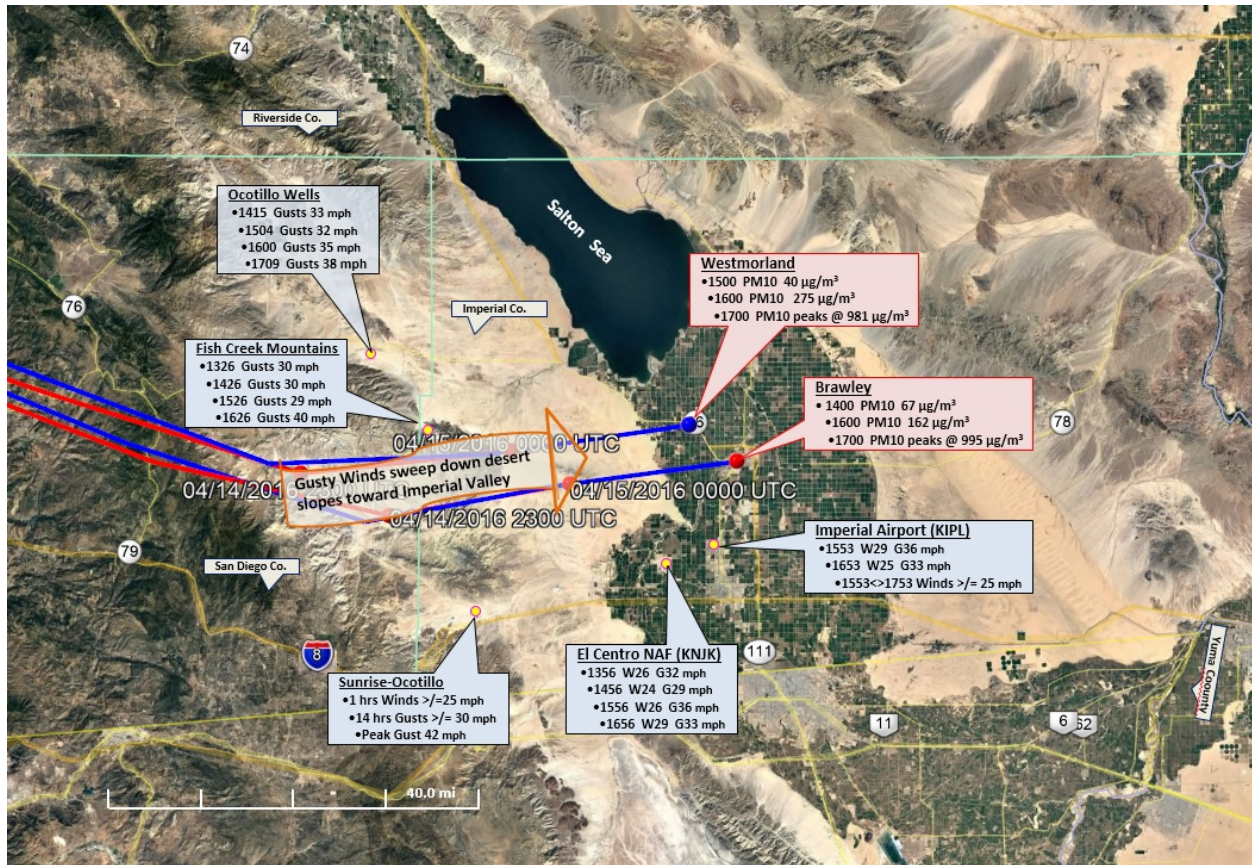


Fig 5-6: Winds entrained dust on the western edge of the Sonoran Desert and transported it into Imperial County. The 6-hour HYSPLIT back-trajectory depicts the general airflow ending at Brawley and Westmorland at 1700 PST. Red trajectories indicate air flow at 10m; blue is air flow at 100m. Times are for the red trajectory. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figure 5-7 and 5-8 depict PM₁₀ concentrations and wind speeds over a 72-hour period at Brawley and Westmorland. Fluctuations in hourly concentrations at Brawley and Westmorland over 72 hours show a positive correlation with wind speeds, and particularly gusts, at Imperial County Airport (KIPL) and El Centro NAF (KNJKL).

FIGURE 5-7
BRAWLEY PM₁₀ CONCENTRATIONS AND WIND SPEED CORRELATION

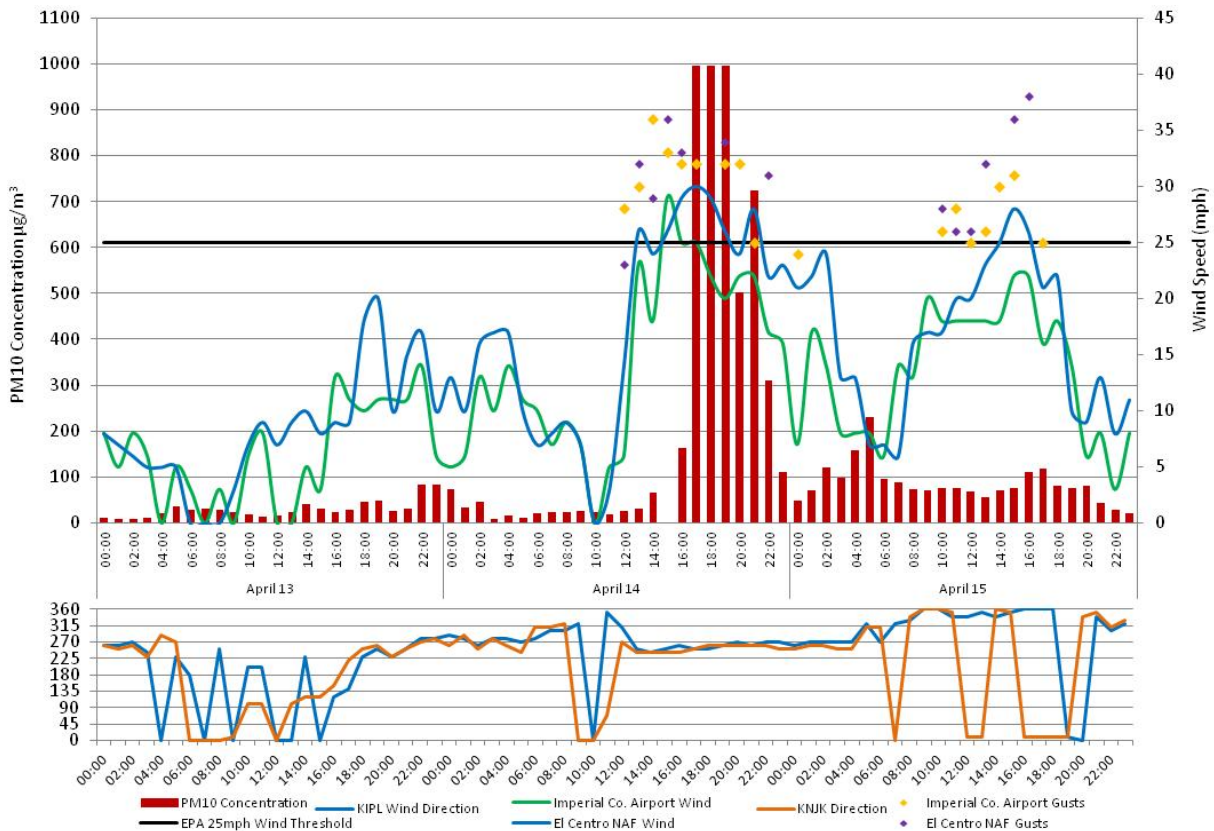


Fig 5-7: Fluctuations in hourly concentrations over 72 hours show a positive correlation with wind speeds, and particularly gusts, at Imperial County Airport (KIPL) and El Centro NAF (KNJKL). Wind speeds increased as the wind shifted more westerly around noon. Brawley station does not measure wind. Black line indicates 25 mph threshold. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD system

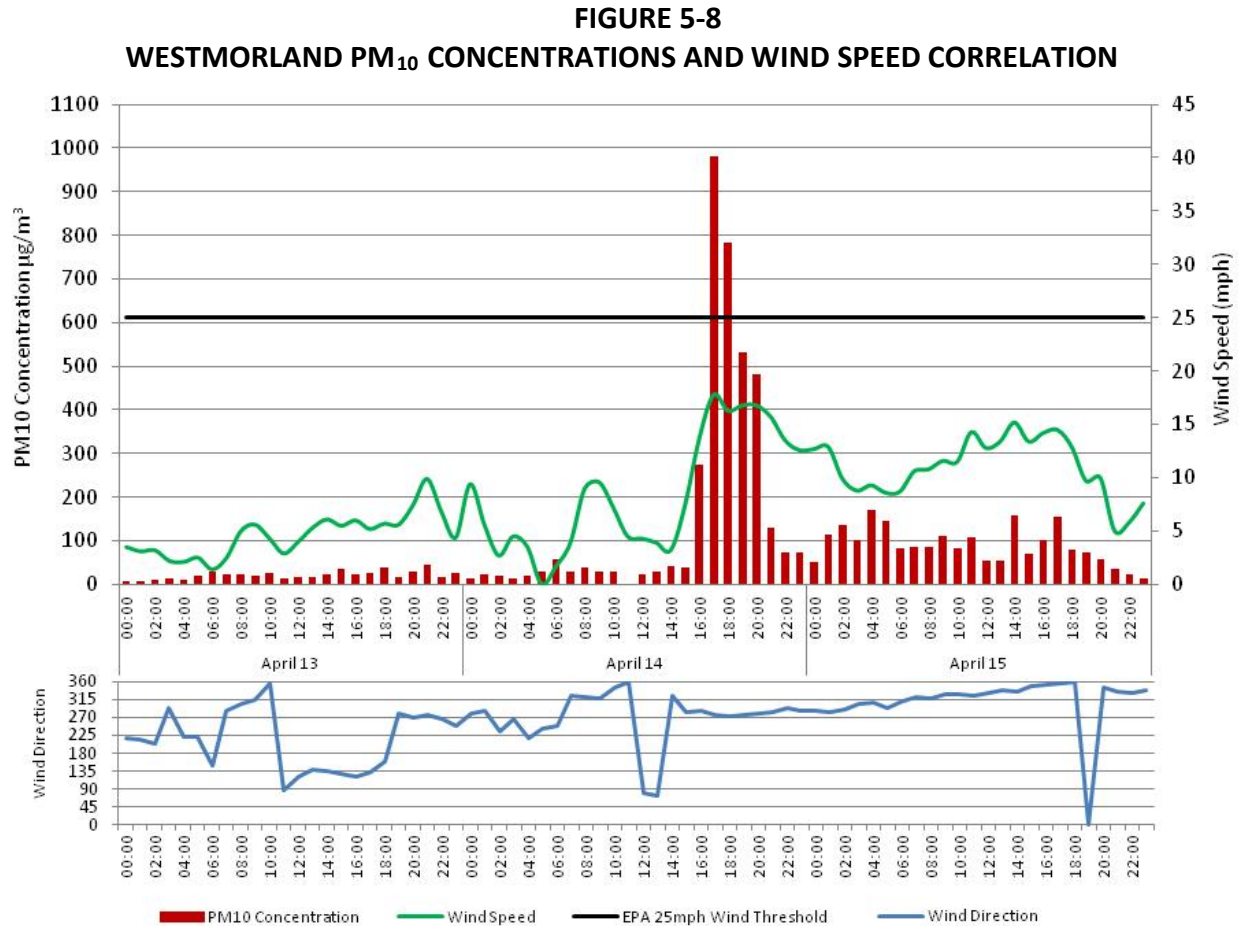


Fig 5-8: The lesser wind speeds at Westmorland allowed for dust entrained upstream to be deposited on the monitor. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

Figure 5-9 shows the PM₁₀ concentrations at Brawley and Westmorland along with the wind speeds at upstream locations. Increasing winds and gusts up through midafternoon transported dust downstream to the monitors. But as winds increased later on toward the end of the day the dust was washed out of the area as concentrations fell.

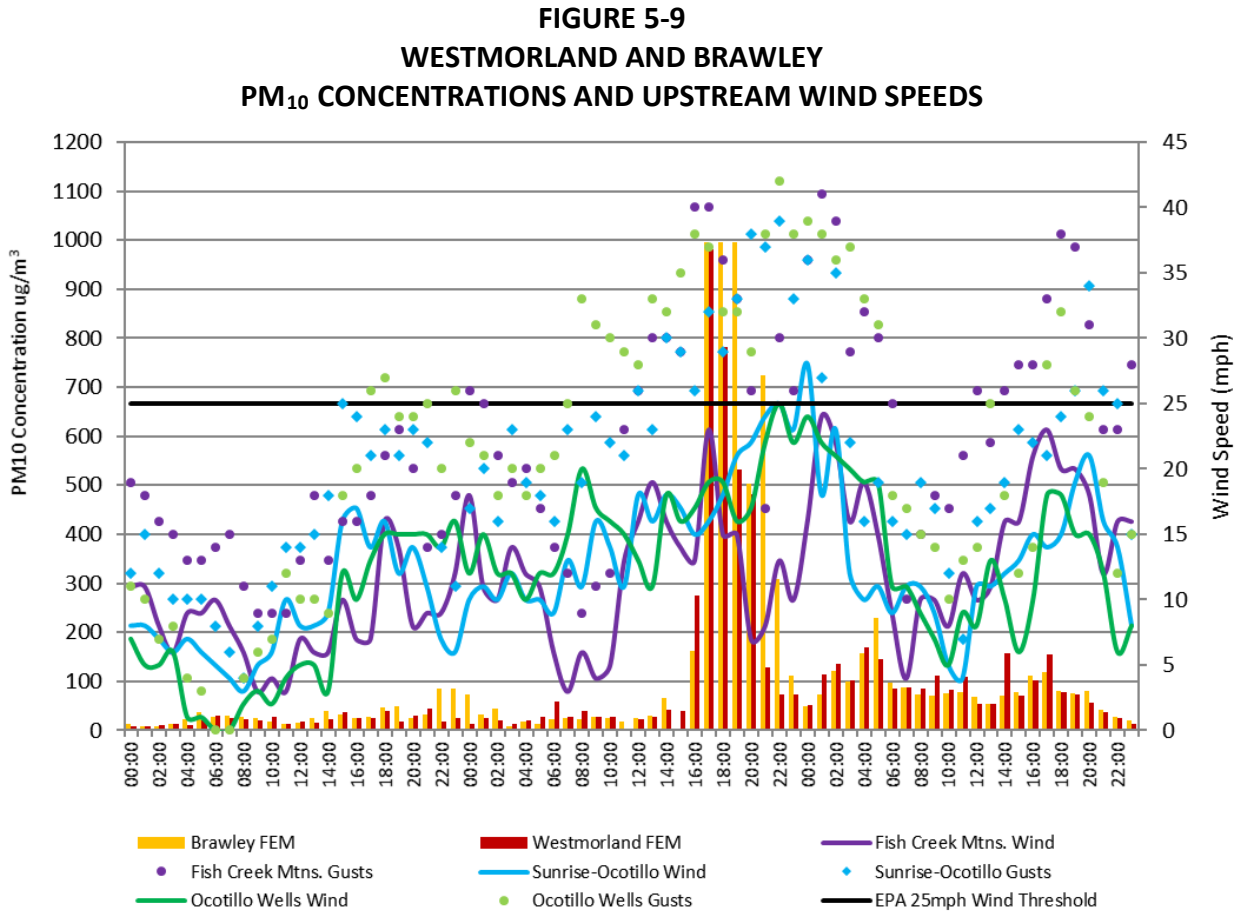


Fig 5-9: An increase in winds and particularly gusts at upstream sites led to an increase in PM₁₀ concentrations as the dust laden winds made their way downstream. Although winds remained high on March 12, 2016, increased humidity and precipitation in the San Diego county mountains to the west of Imperial County acted to retard fugitive dust levels. Air quality data from the EPA’s AQS data bank. Wind data from the University of Utah’s MesoWest

The Air Quality Index for Westmorland depicted in **Figure 5-10** helps explain how air quality is degraded when transported windblown dust by high winds enters Imperial County.¹¹ Westmorland air quality remained in the Good or “Green” category until falling into the Moderate or “Yellow” range (PM₁₀ 51-100 µg/m³) at 7 p.m. At 10 p.m. air quality entered the “Orange” or Unhealthy for Sensitive Groups level (PM₁₀ 101-150 µg/m³).

¹¹ The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health affects you may experience within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health. Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country. Source: <https://airnow.gov/index.cfm?action=aqibasics.aqi>

FIGURE 5-10
AIR QUALITY INDEX FOR WESTMORLAND
APRIL 14, 2016

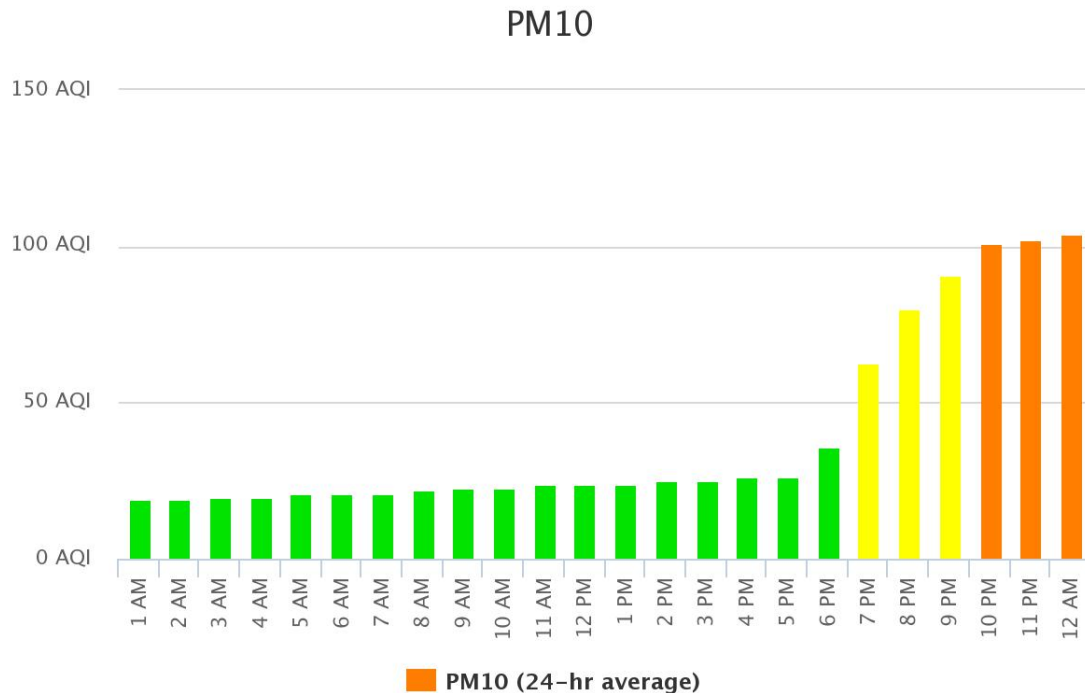


Fig 5-10: The reduced air quality in Westmorland shows that the fugitive dust transported by high winds affected the air quality in Imperial County. Source: ICAPCD archives

V.2 Summary

The preceding discussion, graphs, figures and tables provide wind direction, wind speed and PM₁₀ concentration data illustrating the spatial and temporal representation of the gusty west winds that were associated with the passage a powerful Pacific weather disturbance that passed through the region. The information provides a clear causal relationship between the entrained windblown dust and the PM₁₀ exceedance measured at the Brawley and Westmorland monitors on April 14, 2016. Furthermore, the advisories and air quality index illustrate the affect upon air quality within the region extending from the mountains and desert slopes of San Diego County, all of Imperial County and the southern portion of Riverside County. Large amounts of coarse particles (dust) and PM₁₀ were carried aloft by strong westerly winds into the lower atmosphere causing a change in the air quality conditions within Imperial County. The entrained dust originated from as far as the mountains and desert slope areas located within San Diego County and Imperial County (part of the Sonoran Desert). Combined, the information demonstrates that the elevated PM₁₀ concentrations measured on April 14, 2016 coincided with high wind speeds and that gusty west winds were measured over the southern portion of Riverside County, southeastern San Diego County, all of Imperial County, and parts of Arizona.

FIGURE 5-11
APRIL 14, 2016 WIND EVENT TAKE AWAY POINTS

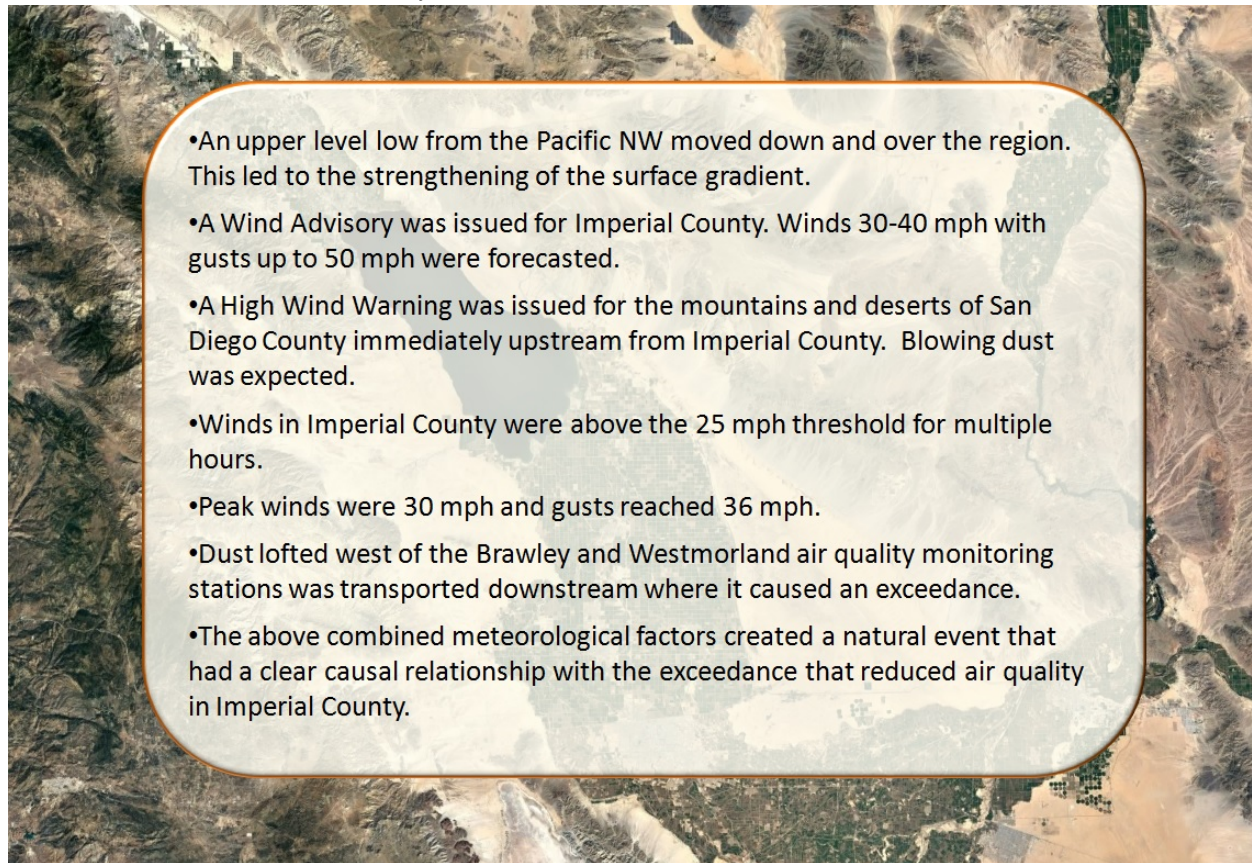


Fig 5-11: Illustrates the factors that qualify the April 14, 2016 natural event which affected air quality as an Exceptional Event

VI Conclusions

The PM₁₀ exceedance that occurred on April 14, 2016, satisfies the criteria of the EER which states that in order to justify the exclusion of air quality monitoring data evidence must be provided for the following elements:

TABLE 6-1 TECHNICAL ELEMENTS CHECKLIST		
EXCEPTIONAL EVENT DEMONSTRATION FOR HIGH WIND DUST EVENT (PM ₁₀)		DOCUMENT SECTION
1	A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	6-29
2	A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation	44-56, 58
3	Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the requirement at paragraph (c)(3)(iv)(B) of this section	30-36, 58
4	A demonstration that the event was both not reasonably controllable and not reasonably preventable	37-43, 57
5	A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event	6-29; 37-43, 58

VI.1 Affects Air Quality

The preamble to the revised EER states that an event has affected air quality if the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation. Given the information presented in this demonstration, particularly Section V, we can reasonably conclude that there exists a clear causal relationship between the monitored exceedance and the April 14, 2016 event, which changed or affected air quality in Imperial County.

VI.2 Not Reasonably Controllable or Preventable

Section 50.1(j) of 40 CFR Part 50 defines an exceptional event as an event that must be “not reasonably controllable or preventable” (nRCP). The revised preamble explains that the nRCP has two prongs, not reasonably preventable and not reasonably controllable. A natural wind event, which transports dust from natural open deserts, meets the nRCP, when sources are controlled by BACM and when human activity plays little to no direct causal role. This demonstration provides evidence that despite BACM in place within Imperial County, strong

gusty west winds overwhelmed all BACM controls where human activity played little to no direct causal role. The PM₁₀ exceedance measured at the Brawley and Westmorland monitors caused by naturally occurring strong gusty westerly winds transported windblown dust into Imperial County and other parts of southern California from areas located within the San Diego Mountains. These facts provide strong evidence that the PM₁₀ exceedance at the Brawley and Westmorland monitors on April 14, 2016, were not reasonably controllable or preventable.

VI.3 Natural Event

The revised preamble to the EER clarifies that a “Natural Event” (50.1(k) of 40 CFR Part 50) is an event and its resulting emissions, which may recur at the same location where anthropogenic sources that are reasonably controlled are considered not to play a direct role in causing emissions, thus meeting the criteria that human activity played little or no direct causal role. As discussed within this demonstration, the PM₁₀ exceedances that occurred at Brawley and Westmorland on April 14, 2016, were caused by the transport of fugitive dust into Imperial County by strong westerly winds associated with the passage of low pressure system and accompanying dry cold that moved through the region. At the time of the event anthropogenic sources were reasonably controlled with BACM. The event therefore qualifies as a natural event.

VI.4 Clear Causal Relationship

The time series plots of PM₁₀ concentrations at Brawley, Westmorland, and Niland during different days, and the comparative analysis of different areas in Imperial and Riverside county monitors demonstrates a consistency of elevated gusty west winds and concentrations of PM₁₀ at the Brawley and Westmorland monitoring stations on April 14, 2016 (Section V). In addition, these time series plots and graphs demonstrate that the high PM₁₀ concentrations and the gusty west winds were an event that was widespread, regional and not preventable. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty west winds. Days immediately before and after the high wind event PM₁₀ concentrations were well below the NAAQS. Overall, the demonstration provides evidence of the strong correlation between the natural event and the entrained fugitive emissions to the exceedances on April 14, 2016.

VI.5 Historical Concentrations

The historical annual and seasonal 24-hr average PM₁₀ values measured at the Brawley and Westmorland monitors were historically unusual compared to a multi-year data set (Section III).

Appendix A: Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

This section contains wind advisories issued by the National Weather Service and Imperial County on or around April 14, 2016. The data show a region-wide increase in wind speeds and wind gusts coincident with the arrival of dust and high PM₁₀ concentrations in Imperial County.

Appendix B: Meteorological Data.

This Appendix contains the time series plots, graphs, wind roses, etc. for selected monitors in Imperial and Riverside Counties. These plots, graphs and tables demonstrate the regional impact of the wind event.

Appendix C: Correlated PM₁₀ Concentrations and Winds.

This Appendix contains the graphs depicting the correlations between PM₁₀ Concentrations and elevated wind speeds for selected monitors in Imperial and Riverside Counties. These graphs demonstrate the region wide impact of the wind event.

Appendix D: Regulation VIII – Fugitive Dust Rule.

This Appendix contains the compilation of the BACM adopted by the Imperial County Air Pollution Control District and approved by the United States Environmental Protection Agency. A total of seven rules numbered 800 through 806 comprise the set of Regulation VIII Fugitive Dust Rules.